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13. ABSTRACT (Maximum 200 Words) This report summarizes accomplishments for the 4th year of a 4 year training program in biopsychosocial breast cancer (BC) research. Two trainees (1 postdoctoral; 1 predoctoral) were reappointed to the training program for the period 7/2002 through 6/2003. Two other trainees (1 postdoctoral; 1 predoctoral) were newly appointed to the training program during the project year. Research training was furnished by a multidisciplinary faculty of 6. The training program consists of 5 components, all of which were implemented during 2002-2003. All trainees participated in a biweekly seminar enabling oversight of trainee activities, didactic presentation of clinical aspects of BC, and discussion of ongoing and anticipated BC-related research projects. Trainees also received supervised guidance in all phases of the research enterprise. Specifically, trainees participated in: (1) development and implementation of 1 group research project and 2 trainee-specific research projects; (2) ongoing data collection, preparation, and analysis for 1 other ongoing group project; and (3) manuscript preparation for 2 completed research projects. A no-cost extension of the training program for a 5 th project year was requested and approved and 1 new predoctoral trainee was recruited and appointed for 2003-2004.				
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- Eight abstracts
- One published manuscript
Andrykowski et al., 2002
- 2 manuscript accepted for publication
Schmidt & Andrykowski, in press
Jacobsen et al., in press

Introduction

High quality research investigating various psychosocial and behavioral aspects of breast cancer has the potential to reduce breast cancer-related mortality as well as improve quality of life following breast cancer. Critical to the development and implementation of high quality research in this area is the recruitment and training of new researchers. This report summarizes activities and accomplishments during the fourth year of a four year research training program in biopsychosocial aspects of breast cancer. The training program is centered in the Department of Behavioral Science, a basic science department in the University of Kentucky College of Medicine. A multidisciplinary training faculty of six is drawn from three academic units within the College of Medicine (Behavioral Science, Medicine-Hematology/Oncology, and Nursing). Funding is provided to support the research training of two predoctoral trainees and one postdoctoral trainee each year. Trainees engage in a variety of supervised research, experiential, and didactic activities under the supervision of training program faculty.

Body

The research training program was initiated on July 1, 1999. This report describes grant-related activities conducted during the fourth year of project funding from July 1, 2002 through June 30, 2003. Following is a summary of activities associated with each of the fourth project year tasks outlined in the approved Statement of Work.

Task 1: Implementation of Research Training Program

The training program consists of five basic components: (1) training in research design, methods, and analysis through supervised participation in breast cancer-related research; (2) formal coursework; (3) individual tutorial in breast cancer-related research; (4) participation in a monthly breast cancer research seminar; and (5) education regarding biological and medical aspects of breast cancer. Each of these components was effectively implemented during project year four of the training program.

Predoctoral trainees in the program are required to complete two specific graduate level courses (component #2 from above). These include a course in "Psychosocial Oncology" and a course in "Integrated Research Methods." Both predoctoral trainees supported during project year four had successfully completed the course in "Integrated Research Methods" during the spring semester of 2001. In addition, both trainees successfully completed the course in "Psychosocial Oncology" during the fall semester of 2001. Thus, both predoctoral trainees supported during project year four have successfully completed all didactic course requirements associated with this DOD-funded research training program in biopsychosocial breast cancer research.

A monthly breast cancer research seminar has been conducted as one of the core components of the training program since the inception of the training program in July, 1999 (component #4 from above). This BC research seminar involves both trainees and training program faculty. Other faculty, graduate students, and postdoctoral trainees from the Department of Behavioral Science interested in biopsychosocial breast cancer research are also invited to attend on an ad

hoc basis. This monthly breast cancer research seminar was expanded to a biweekly format (i.e., twice per month) during project year three and the biweekly format was continued in project year four. Each meeting of this breast cancer research seminar lasted for roughly 60-75 minutes. This breast cancer research seminar provided: (a) an opportunity for all members of the training program to keep abreast of the research activities of the trainees; (b) a forum for training faculty and trainees to discuss recent and ongoing research in biopsychosocial aspects of breast cancer; (c) an opportunity for faculty and trainees to discuss ideas leading to the development of new breast cancer-related research projects at the University of Kentucky; (d) an opportunity for didactic instruction regarding medical and clinical aspects of breast cancer; and (e) an opportunity for trainees to practice and receive feedback on oral presentations they were scheduled to make at upcoming national research conferences.

The training plan provides for education regarding biological and medical aspects of breast cancer to be provided through both didactic instruction and experiential activities (component #5 from above). The biweekly research seminar provided an opportunity for trainees (and program faculty) to share and learn basic medical information regarding breast cancer. In addition, all trainees participated in various experiential activities. These included attendance at integrative patient conferences conducted by the University of Kentucky Comprehensive Breast Care Center as well as "shadowing" of clinicians and breast cancer patients as they are involved in the provision and receipt of medical treatment of breast cancer.

During project year four of the training program, both pre- and postdoctoral research trainees were actively involved in specific research projects under the supervision of training program faculty (component #1 from above). Research projects were either "communal" projects in which all trainees participated or were "individual" research projects which were developed and implemented largely by a single trainee. During project year four of the training program, one new communal research project was implemented. This project is an internet-based study of health and psychosocial behavior change following a cancer diagnosis, in this case, a breast cancer diagnosis. All predoctoral and postdoctoral trainees participated in the development of this new communal research project.

In addition, all predoctoral and postdoctoral trainees participated in one ongoing communal project which was implemented during a previous year of the training program. This ongoing communal project is a prospective and longitudinal study of fatigue during and following treatment for breast cancer. Trainee involvement in this ongoing communal research project ranged across several phases of the research enterprise including data collection, data entry and preparation, data analysis, and manuscript preparation. Trainees were also involved in preparation and submission of a competing continuation R01 application for this research project submitted March 1, 2003.

In addition to these two ongoing communal research projects, pre- and post-doctoral trainees participated in data analysis and manuscript preparation activities associated with two completed communal breast cancer-related research projects. These included: (a) a longitudinal study of the impact of benign breast biopsy upon performance of breast self-examination; (b) a cross-

sectional, experimental, laboratory-based study of emotional expressivity in breast cancer survivors and age- and education-matched women without a history of breast cancer.

Two trainee-specific breast cancer-related research projects also provided research training experience during project year four. John Schmidt, a predoctoral trainee, had a primary-authored manuscript accepted for publication in Health Psychology based upon his Master's thesis research. This research involved a web-based study of dispositional and social factors in psychological adjustment to breast cancer diagnosis and treatment and this research had been conducted with the support of the research training program. In this project, Mr. Schmidt assumed full responsibility for all aspects of development and implementation, data analysis and write-up, thus providing him with supervised experience in all aspects of the research endeavor. A second trainee-specific breast cancer-related research project was developed and implemented by Kristi Graves, Ph.D., a postdoctoral trainee newly appointed to the training program in project year four. Dr. Graves' project is a randomized, controlled clinical trial of two different behavioral interventions in enhancing psychological adjustment in breast cancer patients and survivors. The two interventions to be tested include an expressive writing intervention and a 6-session group intervention based upon social-cognitive theory.

Task 2: Recruitment and Appointment of Research Trainees for Project Year 4

One of the predoctoral trainees during the 2001-2002 academic year (project year 3), John Schmidt, requested reappointment for 2002-2003 (project year 4). Upon review, it was decided that he was making adequate progress in the research training program and Mr. Schmidt was reappointed for the one year period July 1, 2002 through June 30, 2003.

Abbie Beacham, Ph.D., a postdoctoral trainee initially appointed to the training program in August, 2000, completed her training in December, 2002. She left the research training program to accept a position as an assistant professor in the Department of Psychological and Brain Sciences at the University of Louisville.

During the spring of 2002, we initiated a recruitment process to fill one available postdoctoral trainee position and one available predoctoral trainee position. Both positions were available for the 2002-2003 year (project year 4). Availability of the predoctoral training position was advertised campus-wide and an individual was selected and offered the available position upon review of applications. John Salsman, a doctoral candidate in clinical psychology, accepted our offer of appointment to the training program. He began his predoctoral appointment July 1, 2002.

Availability of a postdoctoral training position was advertised in several national professional print publications. The position announcement was also posted to numerous internet websites and was e-mailed to an extensive list of professional colleagues in the social and behavioral sciences. The position announcement was also posted on our departmental website. A total of 10 applications for the position were received. Two candidates were invited to campus for interviews. One candidate (female) was completing her doctoral degree in social health psychology at Kent University. The other candidate (female) was completing her doctoral

degree in clinical psychology at Virginia Tech University. The latter candidate was selected and offered the position. Kristi Graves, Ph.D. accepted our offer of a postdoctoral research training position and began her appointment to the training program on August 6, 2002. Dr. Graves subsequently had to resign her appointment in the DOD research training program effective January 1, 2003 as she was awarded an NIH-funded three year individual postdoctoral research training fellowship. As part of this prestigious award, Dr. Graves will continue her research training in behavioral oncology at the University of Kentucky under the supervision of Michael Andrykowski, Ph.D.

A one year, "no-cost" extension of the research training program for a fifth project year was requested in the spring of 2003. This request was formally approved in June, 2003 and a campus-wide recruitment of a new predoctoral trainee was initiated in late June, 2003. Emily Brechting, a doctoral student in clinical psychology, accepted our offer of appointment to a predoctoral research training position and will begin her appointment August 1, 2003.

Key Research and Training Accomplishments During Project Year Four

- Appointment of a new postdoctoral trainee (Graves) and a new predoctoral trainee (Salsman).
- Review and reappointment of one continuing postdoctoral trainee (Beacham) and one continuing predoctoral trainee (Schmidt).
- Securing of formal approval for a one-year "no-cost" extension for a fifth year of the breast cancer research training program.
- Recruitment of a new predoctoral trainee (Brechtling) for the 2003-2004 academic year (project year 5).
- Postdoctoral trainee (Beacham) leaves training program to assume faculty position at the University of Louisville.
- Postdoctoral trainee (Graves) resigns training program appointment to accept three year NIH-funded individual postdoctoral research training award.
- Publication of one manuscript in peer-reviewed journals based upon research conducted in association with training grant (Andrykowski et al., 2002).
- Two manuscripts accepted for publication in a peer-reviewed journal based upon research conducted in association with training grant (Jacobsen et al., in press; Schmidt & Andrykowski, in press).
- Four manuscripts submitted for publication in peer-reviewed journals based upon research conducted in association with training grant (Beacham et al., 2003; Curran et al., 2003; Donovan et al., 2003; Andrykowski et al., 2003).

- Publication of eight abstracts in peer-reviewed journal based upon research conducted in association with training grant (Andrykowski et al., 2003a; Andrykowski et al., 2003b; Beacham et al., 2002a; Beacham et al., 2002b; Donovan et al., 2003a; Donovan et al., 2003b; Huss et al., 2003; Schmidt and Andrykowski, 2003).
- Postdoctoral trainee's (Beacham) research abstract selected for oral, platform presentation at annual meeting of Society of Behavioral Medicine.
- Predoctoral trainee's (Schmidt) research abstract selected for oral, platform presentation at annual meeting of Society of Behavioral Medicine.
- Implementation of one new communal breast-cancer related research project and one new trainee-specific research project.
- All four trainees supported by research training program during project year four attend and participate in national professional conference (annual meeting of the Society of Behavioral Medicine)
- Successful implementation of all five components of training program

Reportable Outcomes

(Note that all outcomes listed below are only those occurring during project year four and include only outcomes associated with trainees supported during project years 1-4. Names of DOD-supported trainees are in bold.)

Manuscripts published in peer-reviewed journals:

Andrykowski, M.A., Carpenter, J.S., Studts, J.L., Cordova, M.J., Cunningham, L.J., Beacham, A.O., Sloan, D., Kenady, D., & McGrath, P. (2002). Psychological and behavioral sequelae of benign breast biopsy: A longitudinal, comparative study. Health Psychology, 21, 485-494.

Manuscripts accepted for publication in peer-reviewed journals:

Schmidt, J.E., & Andrykowski, M.A. (in press). The role of social and dispositional variables associated with emotional processing in adjustment to breast cancer: An internet-based study. Health Psychology.

Jacobsen, P.B., Andrykowski, M.A., Thors, C.L., & Wessely, S. (in press). Relationship of catastrophizing to fatigue among women receiving treatment for breast cancer. Journal of Consulting and Clinical Psychology.

Published Abstracts :

Andrykowski, M., Beacham, A., & Jacobsen, P. (2003). Utility of a case definition approach for studying the incidence, prevalence, and predictors of cancer-related fatigue [abstract]. Psycho-Oncology, 12 (4, Suppl), S91.

Huss, D., Andrykowski, M.A., Beacham, A., & Jacobsen, P. (2003). Effect of NEO personality traits and treatment type on physical and mental health outcomes after breast cancer. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S59.

Schmidt, J., & Andrykowski, M.A. (2003). The role of social and dispositional variables associated with emotional processing in adjustment to breast cancer: An internet-based study. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S60.

Beacham, A, Andrykowski, M.A., Malik, U., & Jacobsen, P. (2003). Fatigue-related disability in exercisers versus nonexercisers during breast cancer (BC) treatment. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S63.

Donovan, K.A., Andrykowski, M.A., & Jacobsen, P. (2003). History of major depression as a predictor of fatigue in women undergoing treatment for breast cancer. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S65.

Beacham, A, Andrykowski, M.A., Malik, U., & Jacobsen, P. (2003). Accuracy of perceived exertion ratings during treatment for breast cancer (BC). [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S63.

Donovan, K.A., Andrykowski, M.A., & Jacobsen, P. (2003). Impact of catastrophizing on fatigue severity and disruptiveness following breast cancer treatment. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S118.

Andrykowski, M.A., Beacham, A.B., & Jacobsen, P. (2003). Utility of a case definition approach for studying the incidence, prevalence, and predictors of cancer-related fatigue. . [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S119.

Degrees obtained based on training supported by award:

Julie Bollmer, Ph.D., a predoctoral trainee during project years two and three completed the requirements for her Ph.D. degree in Psychology from the University of Kentucky in June, 2003.

John Salsman, M.S., a predoctoral trainee during project year three completed the requirements for his M.S. degree in Clinical Psychology from the University of Kentucky in September, 2002.

Employment opportunities received based on training supported by award:

Abbie Beacham, Ph.D., a postdoctoral trainee during project years one, two and three was appointed as an assistant professor in the Department of Psychological and Brain Sciences at the University of Louisville. Her appointment began in December, 2002.

Julie Bollmer, Ph.D., a predoctoral trainee during project years two and three was appointed to a research scientist position with Westat Corporation, a policy research institute located in Rockville, MD. Her appointment began in July, 2003.

Conclusions

During project year four, two predoctoral trainees and two postdoctoral trainees were supported by the research training program. Each of the five components of the research training program was effectively implemented during project year four of the training program. All predoctoral and postdoctoral trainees received supervised, "hands on" experience in all aspects of conducting biopsychosocial breast cancer-related research. In addition, all predoctoral and postdoctoral trainees had the opportunity to participate in a variety of specific research projects, thus increasing the breadth of their experience. Finally, all predoctoral and postdoctoral trainees had the opportunity for extensive interaction with both patients and health providers in the breast cancer care setting. One of the postdoctoral trainees graduated from the training program to accept a position as an assistant at the University of Louisville. A one year "no-cost" extension for a fifth project year was requested and formally approved. A new predoctoral research trainee was successfully recruited and will begin her appointment during project year five.

References (Research trainees supported by DOD training program in bold)

Andrykowski, M., Beacham, A., & Jacobsen, P. (2003). Utility of a case definition approach for studying the incidence, prevalence, and predictors of cancer-related fatigue [abstract]. Psycho-Oncology, 12 (4, Suppl), S91.

Andrykowski, M.A., Beacham, A.B., & Jacobsen, P. (2003). Utility of a case definition approach for studying the incidence, prevalence, and predictors of cancer-related fatigue. . [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S119.

Andrykowski, M.A., Carpenter, J.S., Studts, J.L., Cordova, M.J., Cunningham, L.J., Beacham, A.O., Sloan, D., Kenady, D., & McGrath, P. (2002). Psychological and behavioral sequelae of benign breast biopsy: A longitudinal, comparative study. Health Psychology, 21, 485-494.

Beacham, A., Andrykowski, M.A., Malik, U., & Jacobsen, P. (2003). Accuracy of perceived exertion ratings during treatment for breast cancer (BC). [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S63.

Beacham, A., Andrykowski, M.A., Malik, U., & Jacobsen, P. (2003). Fatigue-related disability in exercisers versus nonexercisers during breast cancer (BC) treatment. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S63.

Donovan, K.A., Andrykowski, M.A., & Jacobsen, P. (2003). History of major depression as a predictor of fatigue in women undergoing treatment for breast cancer. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S65.

Donovan, K.A., Andrykowski, M.A., & Jacobsen, P. (2003). Impact of catastrophizing on fatigue severity and disruptiveness following breast cancer treatment. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S118.

Huss, D., Andrykowski, M.A., Beacham, A., & Jacobsen, P. (2003). Effect of NEO personality traits and treatment type on physical and mental health outcomes after breast cancer. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S59.

Jacobsen, P.B., Andrykowski, M.A., Thors, C.L., & Wessely, S. (in press). Relationship of catastrophizing to fatigue among women receiving treatment for breast cancer. Journal of Consulting and Clinical Psychology.

Schmidt, J.E., & Andrykowski, M.A. (in press). The role of social and dispositional variables associated with emotional processing in adjustment to breast cancer: An internet-based study. Health Psychology.

Schmidt, J., & Andrykowski, M.A. (2003). The role of social and dispositional variables associated with emotional processing in adjustment to breast cancer: An internet-based study. [abstract] Annals of Behavioral Medicine, 25 (Suppl.), S60.

Appendix

One publication in a peer-reviewed journal based upon research supported by the research training program was published during the fourth project year. A copy of this publication has been included in the appendix (Andrykowski et al., 2002).

Two manuscripts based upon research supported by the research training program were accepted for publication in peer-reviewed journals during project year four. A copy of each of these manuscripts is included in the appendix (Schmidt & Andrykowski, 2003; Jacobsen et al., 2003).

Eight abstracts based upon research supported by the research training program were published in peer reviewed journals during the fourth project year. Copies of these eight abstracts have been included in the appendix (Andrykowski et al., 2003a; Andrykowski et al., 2003b; Beacham et al., 2002a; Beacham et al., 2002b; Donovan et al., 2003a; Donovan et al., 2003b; Huss et al., 2003; Schmidt and Andrykowski, 2003).

Four additional manuscripts based upon research resulting from training program activities were submitted for publication in peer reviewed scientific journals during project year four. These four manuscripts are currently undergoing editorial review at the time of this writing (Beacham et al., 2003; Curran et al., 2003; Andrykowski et al., 2003; Donovan et al., 2003). Should these manuscripts be accepted for publication, copies will be included in a future annual report.

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Utility of a case definition approach for studying the incidence, prevalence, and predictors of cancer-related fatigue

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PURPOSE: Fatigue is a common and debilitating symptom reported by cancer patients during and after (i.e., "off-treatment" fatigue) cancer treatment. Scientific understanding of the epidemiology, etiology, and management of cancer-related fatigue (CRF) is hampered by lack of consensual definition of this syndrome.

METHODS: The utility of a 15-item fatigue diagnostic interview (FDI) for studying CRF was examined in a prospective, longitudinal cohort of 190 women undergoing treatment for Stage 0-II breast cancer. Participants were assessed 3 times: (1) before initiation of adjuvant radiation ($n = 89$) or chemotherapy and radiation ($n = 101$) (Baseline); (2) end of adjuvant treatment (Post-Tx); and (4) 6 months after conclusion of adjuvant treatment (Follow-Up). At each assessment the FDI and a modified version of the SCID was administered by trained interviewer. Respondents also completed the Fatigue Catastrophizing scale.

SUMMARY OF RESULTS: Using the FDI, prevalence of CRF "cases" was 14%, 15%, and 6% at the Baseline, Post-Tx, and Follow-Up assessments, respectively. The corresponding prevalence of "subsyndromal" CRF, defined as reporting a recent 2-week period of significant fatigue without meeting remaining CRF criteria, was 24%, 29%, and 20%. The proportion of CRF "cases" identified as incident cases at Post-Tx and Follow-Up was 81% ($n = 17$) and 60% ($n = 3$), respectively. Univariate analyses of clinical and psychosocial data indicated incident "cases" of CRF at the Post-Tx assessment were characterized by higher fatigue catastrophizing ($p < .05$) and

EFFECT OF NEO PERSONALITY TRAITS AND TREATMENT TYPE ON PHYSICAL AND MENTAL HEALTH OUTCOMES AFTER BREAST CANCER

Debra Huss, M.A., Michael Andrykowski, Ph.D., Abbie Beacham, Ph.D., University of Kentucky; and Paul Jacobsen, Ph.D., University of South Florida

Due to the increasing interest in the inclusion of psychological traits in health psychology research, this study examined the impact of the "Big Five" personality traits (neuroticism, extraversion, openness, agreeableness and conscientiousness) and type of treatment (chemotherapy plus radiation (CT+RT; N=33) or radiation alone (RT; N=47)) on physical and mental health outcomes in a prospective, longitudinal cohort of breast cancer patients (mean age=55 years). Participants completed a measure of current physical and mental health function (MOS -36) at four time points: Prior to start of treatment, at conclusion of initial treatment and at 2 and 6 months after conclusion of treatment. Participants completed the neo-FFI at the 6-month follow-up. A series of repeated measures ANOVA's (time x treatment x personality) were performed using each of the 5 neo personality traits as independent variables, the physical and mental health MOS scores as dependent variables and age as a covariate. Reports of poorer physical health were associated with high neuroticism and low extraversion ($p < .02$). Moreover, for mental health a significant time x treatment x extraversion interaction was obtained ($p < .05$). This interaction suggested that mental health increased more in high extraverts over time relative to low extraverts and this effect was most pronounced in women receiving CT + RT. These findings suggest that extraverts may be better able to engage socially supportive resources in their environment, particularly when undergoing more aversive form of therapy, and this accounts for their better mental health scores.

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THE ROLE OF SOCIAL AND DISPOSITIONAL VARIABLES ASSOCIATED WITH EMOTIONAL PROCESSING IN ADJUSTMENT TO BREAST CANCER: AN INTERNET BASED STUDY

John Schmidt, M.S. and Michael Andrykowski, Ph.D., University of Kentucky

Recent theories suggest that cognitive and emotional processing is critical to successful adjustment to traumatic experiences. In turn, cognitive and emotional processing can be facilitated by both dispositional and social-environmental factors. Conceptualizing breast cancer (BC) as a potentially traumatic experience, this study investigated the relationship between several dispositional (emotional intelligence (EI)) and social-environmental (social support (SS), social constraints (SC)) characteristics theoretically linked to cognitive and emotional processing and current psychological adjustment in 240 BC survivors (mean age=48.3 yrs; mean time post-dx= 29.3 mos). Participants were recruited via postings to internet-based BC support groups. After logging into the study web-site, respondents completed measures of SS, SC, EI, intrusive ideation and avoidance (Impact of Events Scale; IES), and anxiety and depression (Hospital Anxiety and Depression Scale; HADS). Hierarchical regression analyses indicated that both high social constraints and low EI were associated with greater distress as measured by HADS and IES indices (all p 's<.001). In addition, the EI x SC interaction was a significant predictor of IES avoidance and intrusion scores (p 's<.05) while the EI x SS interaction was a significant predictor of HADS depression scores (p <.05). The interaction results suggest that high EI could buffer against the negative impact of an otherwise toxic social environment (i.e., high SC or low SS). Additional hierarchical regression analyses indicated that the Mood Repair component of the EI construct was most strongly associated with better psychological adjustment. Overall, results demonstrate the utility of the internet as a platform for behavioral research, support a social-cognitive processing model of adaptation to BC, and suggest that consideration of EI may broaden this model.

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FATIGUE-RELATED DISABILITY IN EXERCISERS VERSUS NONEXERCISERS DURING BREAST CANCER (BC) TREATMENT

Abbie Beacham, Ph.D.*, Michael Andrykowski, Ph.D., Uzma Malik, M.D., University of Kentucky College of Medicine; and Paul Jacobsen, Ph.D. University of South Florida

The relationship between fatigue-related symptoms and reduced quality-of-life among cancer patients is well established. Efforts to manage these symptoms have been employed with increasing frequency. Intervention studies support mild-to-moderate physical exercise for the management of fatigue-related symptoms during and after adjuvant cancer treatment. This study examined ratings of fatigue severity and disability among women (N=159) diagnosed with Stage 0-II BC receiving adjuvant treatment [chemotherapy (CT; n=82) or radiation (RT; n=77)]. Women completed the Godin Leisure-Time Exercise Questionnaire (LTEQ) to assess exercise frequency, duration and intensity (vigorous/moderate/mild) and the Fatigue Symptom Inventory (FSI) prior to beginning treatment (Baseline) and at treatment completion. Women rated perceived impact of fatigue on cognitive, affective and behavioral symptoms on a 7-item FSI composite disability scale. Most women (64%) reported some form of mild, moderate or vigorous exercise during the six months prior to BC diagnosis and at the end of treatment (62%). Repeated measures ANOVA results indicated that women who exercised during treatment reported lower levels of fatigue disability [$F(1,155)=4.05$; $p<.05$] and peak fatigue severity [$F(1,155)=3.58$; $p=.06$] than non-exercisers. No differences by treatment group were observed. Women exercisers receiving RT were older (MageRT=57.6 vs. MageCT=49.2, $p<.05$) but groups did not differ in fatigue ratings, physical symptoms or depression at treatment completion. Levels of perceived fatigue disability did not seem to be related to frequency, duration or intensity of exercise but to participation in some exercise versus none. Therefore, the inclusion of even lifestyle-based activity during cancer treatment may positively impact fatigue-related disability.

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ACCURACY OF PERCEIVED EXERTION RATINGS DURING TREATMENT FOR BREAST CANCER (BC)

Abbie Beacham, Ph.D.*, Michael Andrykowski, Ph.D., Uzma Malik, M.D., University of Kentucky College of Medicine, and Paul Jacobsen, Ph.D., University of South Florida

Intervention studies support mild-to-moderate physical exercise during and after cancer treatment. Exercise is being prescribed for cancer patients with increased frequency. Subjective Ratings of Perceived Exertion (RPE) of exercise intensity has been used successfully in clinical populations. This study examined RPE accuracy among women (N=169) diagnosed with Stage 0-II breast cancer receiving adjuvant treatment [chemotherapy (CT; n=88) or radiation (RT; n=81)]. Women completed the Godin Leisure-Time Exercise Questionnaire (LTEQ) to assess exercise intensity (Vigorous/Moderate/Mild) and RPE at prior to (baseline) and at treatment completion. Most women (64%) reported some form of exercise during the six months prior to BC diagnosis and at the end of treatment (62%). Women receiving RT were older ($p<.05$) but groups did not differ in fatigue ratings, physical symptoms or depression at treatment completion. Predicted RPE (RPEpred) was defined using metabolic equivalents for Vigorous/Moderate/Mild exercise assessed by the LTEQ. Actual RPE ratings were largely inaccurate and deviated from RPEpred (greater than ± 1 point). Accuracy rates were similar at baseline (Vigorous-13%; Moderate-55%; Mild-50%) and treatment completion (Vigorous-10%; Moderate-51%; Mild-46%). Predictors of rating inaccuracy differed by exercise intensity. Higher peak fatigue ($p<.001$) and physical symptoms predicted RPE inaccuracy in mild and moderate exercise ($p's <.05$). Baseline inaccuracy predicted subsequent inaccuracy at treatment completion across exercise intensities ($p's <.05$). Subjective RPE in cancer patients may be influenced by fatigue and other physical sensations at different levels of exercise intensity. Exercise recommendations should be accompanied by instructions aimed at more accurately interpreting physical exertion and sensations when RPE is utilized.

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HISTORY OF MAJOR DEPRESSION AS A PREDICTOR OF FATIGUE IN WOMEN UNDERGOING TREATMENT FOR BREAST CANCER

Kristine A. Donovan, Ph.D.*, H. Lee Moffitt Cancer Center and University of South Florida; Michael A. Andrykowski, Ph.D., University of Kentucky College of Medicine; and Paul B. Jacobsen, Ph.D., H. Lee Moffitt Cancer Center and University of South Florida

Previous research suggests a relationship between history of depression and fatigue in individuals undergoing cancer treatment. To investigate this relationship further, we tested the hypothesis that a history of Major Depressive Disorder (MDD) would be associated with greater severity and disruptiveness of fatigue over the course of breast cancer treatment. Based on a structured clinical interview conducted at the start of treatment, we identified 105 women with neither current nor past MDD and 16 women with past but not current MDD from a total sample of 130 women. Fifty-three of these women received chemotherapy and 68 received radiotherapy. Compared to women with no history of MDD, women with past MDD reported significantly greater fatigue severity and disruptiveness (measured using the Fatigue Symptom Inventory) at both the beginning and end of treatment (p values $< .05$). This relationship did not differ by treatment type and was evident in the absence of a significant difference between groups in depressive symptomatology (as measured by the CES-D) at the start of treatment ($p=.3$). These results suggest the need for more aggressive management of treatment-related fatigue among women with breast cancer who have a history of MDD and further research into the relationship between depression and fatigue in cancer patients.

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Citation Paper and
Meritorious Student Paper
Paper Session #20 2:00 p.m.-2:15 p.m.

**IMPACT OF CATASTROPHIZING ON FATIGUE
SEVERITY AND DISRUPTIVENESS FOLLOWING
BREAST CANCER TREATMENT**

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Previously reported findings from an ongoing longitudinal study we are conducting demonstrated a negative impact of catastrophizing on the experience of fatigue in women undergoing treatment for early stage breast cancer. We now report the results of a follow-up study designed to evaluate whether reliance on catastrophizing at the end of treatment predicted the experience of fatigue six months after treatment completion. Follow-up data are available for 90 women (mean age=55 years) previously treated with chemotherapy (n=35) or radiotherapy (n=55). As predicted, greater use of catastrophizing at the end of treatment (measured using the Fatigue Catastrophizing Scale) predicted greater fatigue severity and disruptiveness six months later (measured using the Fatigue Symptom Inventory). Catastrophizing remained a significant predictor ($p=.001$ for severity, $p=.002$ for disruptiveness) even after controlling statistically for fatigue severity and disruptiveness at the end of treatment. Additional analyses indicated significant (p values $< .05$) interactions between catastrophizing and type of treatment; catastrophizing appeared to have a greater impact on fatigue severity and disruptiveness in radiotherapy patients than in chemotherapy patients. These results suggest that the negative impact of catastrophizing on fatigue may persist for months following the completion of cancer treatment, particularly in patients receiving local forms of therapy. Findings also raise the possibility that interventions to modify catastrophizing may be effective in reducing fatigue in cancer survivors.

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Paper Session #20 2:45 p.m.–3:00 p.m.

UTILITY OF A CASE DEFINITION APPROACH FOR STUDYING THE INCIDENCE, PREVALENCE AND PREDICTORS OF CANCER-RELATED FATIGUE

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Fatigue is a common and debilitating symptom reported by cancer patients during and after (i.e., "off-treatment" fatigue) cancer treatment. Scientific understanding of the epidemiology, etiology, and management of cancer-related fatigue (CRF) is hampered by lack of consensual definition of this syndrome. The utility of a 15-item fatigue diagnostic interview (FDI) for studying CRF was examined in a prospective, longitudinal cohort of 190 women undergoing treatment for Stage 0-II breast cancer. Participants were assessed 3 times: (1) before initiation of adjuvant radiation (n=89) or chemotherapy and radiation (n=101) (Baseline) (2) end of adjuvant treatment (Post-Tx) and (4) 6 months after conclusion of adjuvant treatment (Follow-Up). At each assessment the FDI and a modified version of the SCID was administered by trained interviewer. Respondents also completed the Fatigue Catastrophizing scale. Using the FDI, prevalence of CRF "cases" was 14%, 15%, and 6% at the Baseline, Post-Tx, and Follow-Up assessments, respectively. The corresponding prevalence of "sub-syndromal" CRF, defined as reporting a recent 2-week period of significant fatigue w/o meeting remaining CRF criteria, was 24%, 29%, and 20%. The proportion of CRF "cases" identified as incident cases at Post-Tx and Follow-Up was 81% (n=17) and 60% (n=3), respectively. Univariate analyses of clinical and psychosocial data indicated incident "cases" of CRF at Post-Tx assessment were characterized by higher fatigue catastrophizing ($p < .05$) and greater likelihood of SCID depressive disorder at Baseline ($p < .05$). We conclude use of the FDI to identify "cases" of CRF is critical to scientific understanding of CRF. Data suggest the prevalence of CRF, particularly "off treatment" CRF, may be overestimated in studies not employing a case definition approach to CRF.

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Psychological Impact of Benign Breast Biopsy: A Longitudinal, Comparative Study

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The impact of benign breast biopsy (BBB) on distress and perceptions of risk for breast cancer (BC) was examined. Interviews were conducted with 100 women shortly after notification of biopsy results and 4 and 8 months post-BBB. Compared with matched healthy comparison (HC) women without BBB, the BBB group evidenced greater BC-specific distress at baseline. BC-specific distress declined after BBB, remaining elevated relative to the HC group at the 8-month follow-up. Dispositional (optimism, informational coping style), demographic (education), clinical (family history of BC), and cognitive (BC risk perception) variables were associated with baseline levels of BC-specific distress or persistence of distress. Results support the monitoring process model (S. M. Miller, 1995) and the cognitive social health information processing model (S. M. Miller, Y. Shoda, & K. Hurley, 1996).

Key words: biopsy, psychosocial, behavioral, breast cancer, detection, diagnosis

The value of early detection and diagnosis has been demonstrated for a variety of cancers, including those of the breast, colon, prostate, and cervix. However, although the benefits of early detection and diagnosis are well recognized, it is less well recognized that participation in cancer screening and diagnostic activities can have a negative psychological impact, even when a malignancy is not found (Lerman, Rimer, & Engstrom, 1991; Wardle & Pope, 1992). Concern has been raised about the negative impact of an abnormal or equivocal screening test result (Lerman, Trock, Rimer, Jepson, et al., 1991), when test results raise the possibility that a malignancy might be present or do not immediately reassure that a malignancy is not present. All cancer screening tests yield a certain proportion of such results. Fortunately, the majority of abnormal or equivocal test results are not due to the presence of a malignancy. This does not imply, however, that the impact of such

test results is completely benign. Rather, the individual is likely to experience uncertainty regarding his or her health status. This uncertainty may be associated with significant anxiety. Abnormal or equivocal screening test results likely challenge the routine belief that one is healthy and force the individual to confront the possibility of having a potentially life-threatening, malignant disease. Some have suggested that anxiety may remain for months or even years after abnormal or equivocal test results (Lerman, Trock, Rimer, Boyce, et al., 1991).

Abnormal or equivocal test results are a common occurrence in breast cancer (BC) screening. Up to 20% of mammograms performed in large-scale screening programs yield abnormal or inconclusive results (Lerman, Trock, Rimer, Jepson, et al., 1991). Follow-up is typically warranted and might simply involve a repeat mammogram. However, some abnormal results require a diagnostic, surgical procedure, such as excisional breast biopsy or fine needle aspiration (FNA), to rule out malignancy. Positive biopsy rates from series of surgical biopsies range from 10%–40% (Alexander, Candela, Dershaw, & Kinne, 1990; McCreery, Frankl, & Frost, 1991). Thus, most breast biopsy results are benign; that is, no malignancy is found.

Although a woman is undoubtedly relieved when no breast malignancy is found, the biopsy experience may not be completely benign. Rather, benign breast biopsy (BBB) may have distinct negative psychological consequences. These include distress and exaggerated perceptions of personal risk for BC. For some women, the psychological impact can be profound. For example, 5 of 30 women who underwent BBB in a study of the impact of a false positive mammogram described this experience as the worst event of their lives (Gram, Lund, & Slenker, 1990).

Although the psychological consequences of BBB are potentially significant, research examining the impact of BBB is sparse. Few studies have focused on BBB per se. Rather, most studies have examined the impact of participation in a BC screening program in general (e.g., Bull & Campbell, 1991; Cockburn,

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Staples, Hurley, & De Luise, 1994) or have examined the impact of an abnormal mammography result in particular (Austoker & Ong, 1994; Brett, Austoker, & Ong, 1998; Gram et al., 1990; Lerman, Trock, Rimer, Boyce, et al., 1991; Lerman, Trock, Rimer, Jepson, et al., 1991; Lowe, Balanda, Del Mar, & Hawes, 1999; Ong & Austoker, 1997; Ong, Austoker, & Brett, 1997; Smith, Botha, & Goosey, 1991).

Not surprisingly, studies of the impact of an abnormal mammography result suggest the presence of elevated distress following notification of the need for additional follow-up (e.g., Ong & Austoker, 1997; Smith et al., 1991). However, whether distress remains elevated after additional follow-up rules out malignancy is unknown. Elevated levels of distress have been found at follow-up assessments 1 month (Lowe et al., 1999), 3 months (Lerman, Trock, Rimer, Boyce, et al., 1991; Lerman, Trock, Rimer, Jepson et al., 1991), 5 months (Brett et al., 1998), 11 months (Ong et al., 1997), and 18 months (Gram et al., 1990) following an abnormal mammogram result. In contrast, other investigators have found an abnormal mammogram result yields only a transitory increase in distress that dissipates within a few weeks or months (Bull & Campbell, 1991; Cockburn et al., 1994).

Diagnostic surgical procedures such as breast biopsy or FNA are typically used in cases of abnormal results for which the index of suspicion is highest. Thus, it might be assumed that BBB is potentially more stressful than the experience of an abnormal screening result that is not followed by breast biopsy. Not surprisingly, studies have documented the presence of considerable anxiety and distress while awaiting the biopsy procedure (e.g., Lowe et al., 1999; Northouse, Jeffs, Cracchiolo-Caraway, Lampman, & Dorris, 1995) and while awaiting notification of biopsy results (Chen et al., 1996). However, few studies have examined psychological outcomes after notification that biopsy results are benign. Deane and Degner (1998) assessed 70 women soon after they learned their biopsy result. Compared with normative data, women experienced heightened anxiety and uncertainty even after being informed of their benign result. Lindfors, O'Connor, Acordelo, and Liston (1998) compared the psychological status of 80 women having short-interval follow-up mammography after detection of a benign breast lesion with 58 women who underwent BBB. Four to 6 months later, women in the BBB group reported greater stress than the follow-up mammography group. Brett et al. (1998) assessed women in a screening mammography program 1 month and 5 months after mammography. At the 5-month follow-up, 10% of women who received a normal mammogram result evidenced "adverse psychological consequences" (p. 396). Among 64 women receiving an abnormal mammogram result followed by a benign biopsy or FNA, the proportions of women evidencing adverse psychological consequences were 61% and 44%, respectively. These proportions were lower than those evident at the 1-month follow-up, suggesting that deleterious effects of BBB might dissipate over time. Finally, Stanton and Snider (1993) assessed mood pre- and post-breast biopsy in 117 women, 81 of whom received a benign diagnosis. Demographic variables (primarily less education) were the only significant predictors of post-BBB negative affect.

In sum, little is known regarding the psychological impact of BBB per se. The few studies that have focused on BBB suggest elevated distress may be a consequence of BBB. However, these studies are generally limited both methodologically and conceptually.

Methodological limitations include small samples, assessment of distress at only a single post-BBB follow-up, failure to assess longer term (e.g., > 6 months) BBB outcomes, failure to control family history of BC in the analyses, and reliance on global distress measures. Conceptually, research has been limited by a focus on the simple documentation of distress after BBB with little attempt to identify variables accounting for variance in psychological response. Research has also been atheoretical, with no attempt to use theory to guide selection of predictor or outcome variables.

A theoretical model relevant to BBB is the monitoring process model (MPM; Miller, 1989, 1995; Miller, Rodolitz, Schroeder, Mangan, & Sedlacek, 1996). According to the MPM, individuals differ with regard to informational coping style, that is, the extent to which and manner in which they seek health-relevant information and respond to threatening events. Individuals characterized by a monitoring coping style (*monitors*) tend to actively scan the environment for health-relevant information. Those characterized by a blunting style (*blunters*) tend to avoid or minimize health-relevant information. Under conditions of low threat, monitors and blunters do not differ much with regard to cognition, affect, or behavior. However, when confronted with a threatening health event, such as breast biopsy, differences emerge. Monitors are likely to respond with distress because of their tendency to actively seek information and to amplify threat both cognitively and emotionally. Blunters are less likely to evidence distress because they tend to avoid and blunt threatening health information.

The tendency to respond to life events with optimism or pessimism may also affect response to BBB. Dispositional optimism is a set of generalized expectancies for positive or negative future outcomes and predicts coping behavior and physical and psychological response to threatening events (Scheier & Bridges, 1995; Scheier & Carver, 1985). It might be expected that women low in dispositional optimism might respond to BBB with increased distress and perceptions of BC risk.

The purpose of the present study is to identify the psychological impact of BBB. In contrast to most previous research, the present study uses a longitudinal design and a comprehensive set of outcome measures. In addition to documenting the occurrence of distress in response to BBB, the present study seeks to identify demographic, clinical, and psychological variables associated with individual differences in psychological outcomes, both initially and across time. We predicted that (a) BBB will result in elevated levels of distress and perceptions of personal BC risk relative to healthy women without a history of BBB, (b) women with a monitoring coping style will evidence greater and more persistent distress in response to BBB, and (c) women characterized by low dispositional optimism will evidence greater and more persistent distress in response to BBB.

Method

Sample

Potential participants in the BBB group were identified from the roster of patients at the University of Kentucky Comprehensive Breast Care Center. Eligibility criteria for the BBB group included (a) over 18 years of age; (b) scheduled to undergo a breast biopsy or FNA for diagnostic purposes; (c) no prior history of BC, breast biopsy, or FNA; (d) able to read

and understand English; (e) telephone in the home; and (f) written informed consent.

Using these criteria, 143 eligible women in a consecutive series were identified between December 1996 and November 1997. Of these, 129 (90%) provided written consent for study participation. Of the 14 women who declined participation, most cited being "too busy" or "too stressed." Fifteen women who provided consent were later deemed ineligible for study. These included 7 women diagnosed with BC, 3 women who did not complete the initial interview, and 5 women did not complete the initial interview within 50 days of BBB. Seventy-six women from the community were recruited to form a healthy comparison (HC) group. Eligibility criteria for the HC group were (a) over 18 years of age; (b) no history of BC, biopsy, or FNA; (c) able to read and understand English; (d) telephone in the home; and (e) written informed consent for participation.

Procedure

Potential participants in the BBB group were identified from the daily clinic roster of the University of Kentucky Comprehensive Breast Care Center. Prior to undergoing a biopsy or FNA, eligible women were introduced to the study by the physician managing their care. Women were then given a detailed explanation of the study by a research staff member. Written informed consent for study participation was then obtained. Following notification of biopsy or FNA results, women with benign findings were telephoned by a research staff member and an initial interview was scheduled. The initial interview was conducted via telephone and was completed a mean of 21.4 days ($SD = 9.9$, range = 2–47 days) following biopsy or FNA. Additional telephone follow-up interviews were conducted 4 and 8 months after a woman's biopsy or FNA procedure.

Participants in the HC group were recruited through a variety of community print media advertisements. Advertisements solicited women who were interested in participating in a study of women's health. Interested women telephoned the project office and were screened for study eligibility. Eligible women were then scheduled for an initial interview conducted by telephone. All women in the HC group were paid \$15 for completion of the study interview.

Assessment Protocol

During the initial interview, both the BBB and HC groups completed measures to assess (a) demographic and BC risk variables, (b) dispositional variables, (c) social support, (d) psychological distress, (e) BC worry, and (f) perceived BC risk. At the 4- and 8-month follow-up interviews, the BBB group completed the psychological distress section (d) of the assessment protocol. The BBB group also completed the BC worry (e) and perceived BC risk (f) sections at the 8-month follow-up. In addition, 2 of every 3 women in the BBB group were randomly assigned to complete these last two sections at the 4-month follow-up.

Demographic and BC risk variables. Information obtained included age, race, marital status, education, and annual household income. Information for estimating both relative (Gail et al., 1989) and lifetime (Benichou, 1993) risk for BC was obtained including age at menarche, parity, history of BBB, and number of first-degree relatives (FDRs) with BBB.

Dispositional variables. These included the Miller Behavioral Styles Scale—Short Form (MBSS-SF; Steptoe, 1989), a measure of informational coping style yielding Monitor and Blunter subscales, and the Life Orientation Test (LOT; Scheier & Carver, 1985), a measure of dispositional optimism. Coefficient alpha was .63 for the MBSS-SF Monitor subscale and .83 for the LOT.

Social support. Women completed the eight-item Duke-UNC Functional Social Support Questionnaire (DUKE-SSQ; Broadhead, Gehlbach, De Gruy, & Kaplan, 1988), a measure of current affective social support. Coefficient alpha was .83.

Psychological distress. Measures of general distress included the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff,

1977), a measure of current depressive symptoms, and the 37-item short form of the Profile of Mood States (POMS-SF; Shacham, 1983), a measure of current mood disturbance yielding a total mood disturbance score. Women also completed the 15-item Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979), a measure of current avoidant and intrusive cognition regarding a specified stressor—in this case "the possibility that you will develop BC in your lifetime." Used in this manner, the IES can be seen as a measure of psychological distress or preoccupation specific to BC. The IES yields Intrusion and Avoidance subscale (IES-Intrusion and IES-Avoidance) scores. Coefficient alphas were .92 for the CES-D, .85 for the POMS-SF, and .87 and .90, respectively, for IES-Avoidance and IES-Intrusion scores.

BC worry. Worry regarding BC was assessed using items adopted from previous research (Cunningham et al., 1998; Lerman, Trock, Rimer, Jepson, et al., 1991). Women indicated how often they "worried about getting BC someday" (BC-Worry). Responses were made on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*almost all of the time*). Women also indicated how much "worrying about BC affected your mood" and how much "worrying about BC affected your daily activities." For both questions, responses were made on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*a lot*). Responses to these latter two BC-Worry items were highly correlated ($r = .64$), and they were summed to form a two-item composite index of BC worry impact (BC-Worry Impact; cf. Lerman, Trock, Rimer, Jepson et al., 1991).

Perceived BC risk. Two subjective estimates of lifetime risk for BC were obtained. Women estimated their personal lifetime risk for BC by providing a percentage between 0 and 100 in response to the question, "What are the chances that you will develop BC some day?" (Personal BC Risk; Lerman et al., 1995). Women also estimated typical lifetime risk for BC by providing a percentage between 0 and 100 in response to the question, "What are the chances that the average woman your age will develop BC some day?" (Typical BC Risk; Andrykowski et al., 2001). The Personal BC Risk and Typical BC Risk items were combined to form a Comparative BC Risk index. This was accomplished by subtracting Personal BC Risk from Typical BC Risk for each woman.

Data Preparation and Analysis

An alpha level of .05 was used as the criterion for statistical significance. Interaction effects in regression analyses were investigated using methods suggested by Jaccard, Turrisi, and Wan (1990). To reduce multicollinearity, all variables were standardized prior to use in the regression analysis. The form and nature of any significant interaction effects was then determined using methods suggested by Jaccard et al. (1990).

Results

BBB and HC groups

Although 114 women completed the initial interview within 50 days of BBB, only 100 women completed all three scheduled study interviews. These 100 women constituted the BBB group in subsequent analyses. Most of the BBB group (62%) underwent breast biopsy, and the remainder underwent an FNA (31%) or both biopsy and FNA procedures (7%). Comparison of these 100 women with the 14 women who failed to complete one or both follow-up interviews revealed no differences with regard to age; education; relative and lifetime BC risk; number of FDRs with BC; or IES, POMS, or CES-D scores at the initial interview (all $ps > .10$). However, women who did not complete both follow-up interviews were more likely to be non-Caucasian, $\chi^2(1, N = 114) = 20.53, p < .01$, and to report greater perceived personal risk for BC at the initial interview, $t(110) = 3.33, p < .01$.

Demographic and clinical characteristics for the BBB and HC groups are shown in Table 1. Chi-square and *t*-test analyses indicated that the BC and HC groups did not differ with regard to age, race, number of FDRs with BC, annual household income, employment, or marital status (all *ps* > .05). However, the HC group was significantly more educated than the BBB group, $t(175) = 3.46, p < .01$, and the BBB group had a higher objective lifetime risk for BC than the HC group, $t(175) = 4.41, p < .01$. This is not surprising, because BBB increases estimates of lifetime BC risk.

Reactions to Biopsy: Immediate Impact

To examine the immediate impact of BBB, responses of the BBB and HC groups at the initial interview were compared using two-group analyses of covariance. Covariates included education and lifetime risk of BC. Dependent variables included total scores on the POMS, CES-D, LOT, and DUKE-SSQ; IES-Intrusion and IES-Avoidance scores; Monitor and Blunter subscale scores from the MBSS-SF; BC-Worry and BC-Worry Impact scores; and the personal, typical, and comparative BC risk variables. Results are shown in Table 2. The two groups differed only insofar as the BBB

Table 1
Demographic and Clinical Characteristics for BBB (*n* = 100)
and HC (*n* = 76) Groups

Variable	BBB group	HC group
Age (in years)		
<i>M</i>	44.2	45.3
<i>SD</i>	14.0	14.2
Range	19.0–84.0	21.0–82.0
Education (in years)		
<i>M</i>	13.8	15.3
<i>SD</i>	3.0	2.5
Range	6–20	10.0–20.0***
Relative risk for BC (%) ^a		
<i>M</i>	3.0	2.7
<i>SD</i>	1.4	0.9
Range	1.4–10.1	1.3–5.8
Lifetime BC risk (%) ^b		
<i>M</i>	10.4	7.7
<i>SD</i>	5.0	3.3
Range	2.7–34.2	1.0–17.1***
Married or partnered (%)	72	67
Caucasian (%)	90	97
Family history of BC (%)		
With 1 FDR with BC	15	12
With ≥2 FDRs with BC	3	0
Annual household income (%)		
<\$20,000	34	28
\$20,000–\$40,000	20	22
\$40,000–\$60,000	16	21
>\$60,000	26	28
Medical Insurance (%)		
No insurance	12	11
Medicare/Medicaid	20	10
Private	68	79

Note. BBB = benign breast biopsy; HC = healthy comparison; BC = breast cancer; FDR = first-degree relative.

^a From Gail et al. (1989). ^b From Benichou (1993).

** *p* < .05. *** *p* < .01.

Table 2
Covariate Adjusted Means and Standard Deviations for BBB
(*n* = 100) and HC Groups (*n* = 76)

Variable	BBB group	HC group	<i>F</i> (1, 173) ^a
POMS–Total			0.14
<i>M</i>	42.1	42.5	
<i>SD</i>	24.4	25.0	
CES–D–Total			0.06
<i>M</i>	10.6	10.2	
<i>SD</i>	10.5	8.7	
IES–Intrusion			7.16***
<i>M</i>	7.0	4.0	
<i>SD</i>	8.2	5.6	
IES–Avoidance			6.09**
<i>M</i>	9.2	5.8	
<i>SD</i>	9.6	8.0	
BC–Worry			0.88
<i>M</i>	1.2	1.4	
<i>SD</i>	1.1	0.9	
BC–Worry Impact			0.36
<i>M</i>	2.0	2.2	
<i>SD</i>	2.3	1.6	
DUKE–SSQ–Total			1.79
<i>M</i>	33.8	32.5	
<i>SD</i>	5.8	4.8	
MBSS–Monitor			0.12
<i>M</i>	5.0	4.9	
<i>SD</i>	1.6	1.8	
MBSS–Blunter			0.71
<i>M</i>	2.8	3.0	
<i>SD</i>	1.3	1.3	
LOT–Total			0.00
<i>M</i>	30.4	30.5	
<i>SD</i>	4.9	5.3	
Personal BC Risk			1.28
<i>M</i>	26.9	30.8	
<i>SD</i>	22.4	20.4	
Typical BC Risk			1.80
<i>M</i>	33.3	37.7	
<i>SD</i>	19.4	21.2	
Comparative BC Risk ^b			0.00
<i>M</i>	6.4	6.4	
<i>SD</i>	20.1	19.4	

Note. BBB = benign breast biopsy; HC = healthy comparison; BC = breast cancer; POMS = Profile of Mood States; CES–D = Center for Epidemiologic Studies Depression Scale; IES = Impact of Events Scale; DUKE–SSQ = Duke–UNC Functional Social Support Questionnaire; MBSS = Miller Behavioral Styles Scale; LOT = Life Orientation Test.

^a Associated with analysis of covariance, with education and lifetime risk for BC (Benichou, 1993) as covariates. ^b Calculated as Typical BC Risk minus Personal BC Risk.

** *p* < .05. *** *p* < .01.

group evidenced higher scores on the Intrusion and Avoidance subscales of the IES (all *ps* < .05).

To test our hypotheses regarding the relationship between dispositional characteristics, specifically optimism and informational coping style, and psychological distress after BBB, two hierarchical regression analyses were performed. IES–Intrusion and IES–Avoidance scores were the dependent variables because these were the only distress indices that were sensitive to the BBB experience (see Table 2). To ensure a conservative test of our hypotheses, clinical (number of FDRs with BC, lifetime risk for BC [Benichou, 1993]), demographic (age, education, race), and social support

(Duke-SSQ-Total) variables were used as covariates. (Interaction terms with these six covariates and the group, MBSS-SF-monitor, and LOT-total variables were constructed and examined for their relationship to IES indices. Because no significant relationships were found, none of these interaction terms were included in the analyses.) Three main effect variables were included in the regression analyses: LOT-total and MBSS-monitor scores and a group variable indicating membership in the BBB or HC group. Three two-way interaction terms (Group \times LOT, Group \times Monitor, LOT \times Monitor) and a three-way interaction term (Group \times LOT \times Monitor) representing the combinations of the three main effect variables were also computed and used in the analyses.

Results for the full 13-variable regression models are shown in Table 3. The 13 variables accounted for a significant portion of the variance in scores for IES-Intrusion (36.2%), $F(13, 162) = 7.06$, $p < .001$, and IES-Avoidance (37.2%), $F(13, 162) = 7.39$, $p < .001$. Education was a significant predictor of both IES indices, with less education associated with greater IES scores ($ps < .01$). The number of FDRs with BC was a significant predictor of IES-Avoidance scores, with greater number of FDRs with BC associated with greater IES-Avoidance scores ($p < .05$). Most importantly, the Group \times LOT \times Monitor interaction was a significant predictor of both IES-Avoidance and IES-Intrusion scores (both $ps < .05$). Inspection of the variance independently attributable to each variable in the regression model (i.e., square of semipartial [sr^2] coefficient) indicated that this interaction independently accounted for 1.9% of the variance in IES-Avoidance

scores and 1.8% of the variance in IES-Intrusion scores. This amount was consistently exceeded only by education, which accounted for about 8%–10% of the variance in the two IES indices, and by the LOT \times Monitor interaction, which accounted for about 2%–3% of the variance in the two IES indices. Inspection of the form of the Group \times Lot \times Monitor interaction for IES-Intrusion and IES-Avoidance scores revealed a similar pattern. In general, a LOT \times Monitor interaction was evident only in the BBB group. In the BBB group, informational coping style was most strongly associated with higher IES scores when optimism was low. When optimism was low, the highest IES scores were reported by those with a high monitoring informational coping style. When optimism was high, much smaller differences between high and low monitors were evident. Figure 1 illustrates the Group \times LOT \times Monitor interaction for IES-Avoidance scores. The form of the Group \times LOT \times Monitor interaction for IES-Intrusion scores was essentially the same as that for IES-Avoidance scores (Figure 1).

Reactions to Biopsy: Change Across Time

To examine whether BC-specific distress changed over time in the BBB group, a set of one-way, repeated-measures analyses of variance (ANOVAs) were performed. Time (three levels: initial, 4-month, and 8-month follow-up) was the within-subjects independent variable in all ANOVAs. The dependent variables were total scores on the POMS and CES-D and Intrusion and Avoidance scores on the IES. Analyses for these four variables were based on the sample of 100 women with complete data at all three time points. Results are shown in Table 4. Results indicated a significant main effect for time for scores for IES-Intrusion (Wilks's $\lambda = .871$), $F(2, 98) = 7.27$, $p < .001$, and IES-Avoidance (Wilks's $\lambda = .845$), $F(2, 98) = 9.02$, $p < .001$. Post hoc analyses using the least significant difference (LSD) test indicated that for both IES indices, scores at the 4- and 8-month assessments were significantly lower than scores at the initial interview (all $ps < .001$). IES scores at the 4- and 8-month assessments were not significantly different from each other. In contrast, there was no significant main effect for time for CES-D or POMS scores (both $ps > .25$).

A similar set of repeated-measures ANOVAs were performed using the BC-Worry; BC-Worry Impact; and the Personal, Typical, and Comparative BC Risk measures as dependent variables. Analyses for these five variables were based on the 68 women who provided complete data for these variables at all three time points. (Comparison of these 68 women with the 32 women randomly assigned to not complete the BC-Worry and risk perception measures at the 4-month follow-up revealed no significant differences on demographic or objective BC risk variables, or on distress and BC worry indices or perceived BC risk at the initial interview; all $ps > .10$.) Results are shown in Table 4. Results indicated no significant main effects for time for BC-Worry, BC-Worry Impact, or any BC risk perception indices (all $ps > .15$).

Although the preceding analyses suggest that IES-Intrusion and IES-Avoidance scores for the BBB group decreased between the initial and 4-month follow-up interview, different patterns of change were evident when individual women were considered. For example, 13 women evidenced an increase in their IES-Avoidance score of at least 0.5 SD between the initial and 4-month follow-up interviews. To identify variables accounting for individual differ-

Table 3
Multiple Regression Analysis of IES Scores for the BBB
($n = 100$) and HC ($n = 76$) Groups

Variable	IES-Intrusion		IES-Avoidance	
	β	sr^2	β	sr^2
Education	-.37***	.097	-.34***	.085
Age at interview	.01	.000	-.10	.004
No. FDRs with BC	.12	.005	.27**	.026
Lifetime BC risk ^a	.12	.004	-.07	.001
Social support	.05	.002	-.02	.000
Race ^b	.15**	.020	.08	.005
Group ^c	-.14*	.014	-.19**	.023
LOT-Total	.36*	.011	-.07	.000
MBSS-Monitor	.24	.005	.10	.001
Group \times LOT	-.40*	.014	-.02	.000
Group \times Monitor	-.16	.002	.01	.000
Lot \times Monitor	-.55**	.027	-.55**	.026
Group \times LOT \times Monitor	.45**	.018	.46**	.019
Full model statistics				
Multiple R	.601		.610	
Multiple R ²	.362		.372	
F(13, 162)	7.06***		7.39***	

Note. IES = Impact of Events Scale; BBB = benign breast biopsy; HC = healthy comparison; β = standardized coefficient for the full, 13-variable model; sr^2 = squared semi-partial correlation; FDR = first-degree relative; BC = breast cancer; LOT = Life Orientation Test; MBSS = Miller Behavioral Styles Scale.

^aFrom Benichou (1993). ^bCoded as 1 = Caucasian and 2 = other.

^cCoded as 1 = BBB group and 2 = HC group.

* $p < .10$. ** $p < .05$. *** $p < .01$.

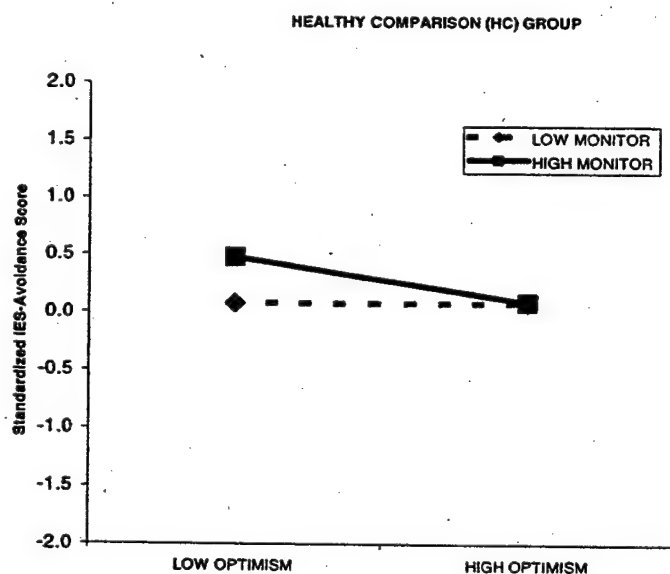
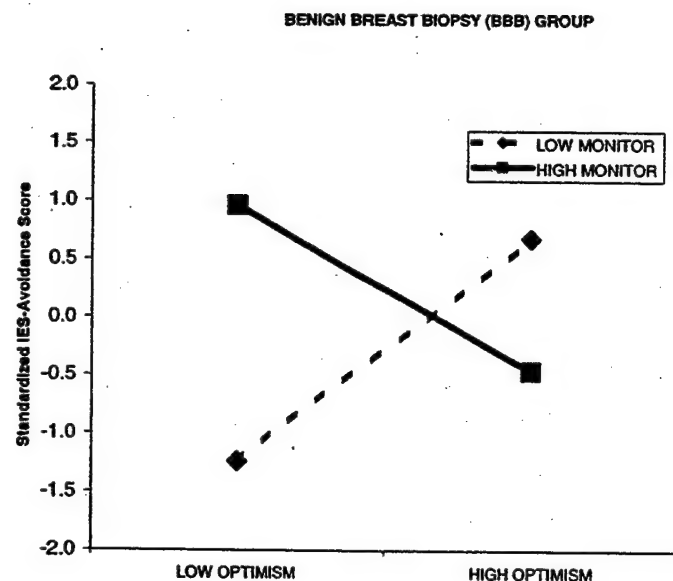


Figure 1. IES-Avoidance subscale scores at the initial interview for the BBB and HC groups as a function of dispositional optimism and informational coping style. IES = Impact of Events Scale.

ences in change in IES scores after BBB, a pair of identical multiple regression analyses were used. Dependent variables were raw change in IES-Avoidance and IES-Intrusion scores between the initial and 4-month follow-up interviews. Eleven predictor variables were used in all three analyses. These included the appropriate IES score at the initial interview; demographic information (race, age, education); objective and subjective BC risk (lifetime risk for BC; Benichou, 1993); number of FDRs with BC; and perceived personal BC risk, dispositional (MBSS-Monitor and LOT-Total scores, LOT \times Monitor interaction), and social support (DUKE-SSQ total) variables.

Results are shown in Table 5. The set of 11 predictor variables accounted for a significant proportion of variance in change between the initial and 4-month interviews for both IES-Avoidance (39.7%) and IES-Intrusion scores (44.3%). IES scores at the initial interview were significantly associated with change for both IES indices, with higher IES scores at the initial interview associated with larger decreases in IES scores after the initial interview. In addition, perceptions of personal BC risk and social support were associated with change in IES-Avoidance scores after the initial interview. Specifically, higher perceptions of personal BC risk were associated with smaller decreases in IES-Avoidance scores after the initial interview, whereas greater social support was associated with larger decreases. An identical pattern of results for these two predictor variables was evident for change in IES-Intrusion scores; however, results narrowly failed to achieve the .05 criterion for statistical significance (both $ps < .10$). Finally, greater education was significantly associated with larger decreases in IES-Intrusion scores ($\beta = .21, p < .05$).

Table 4

Means and Standard Deviations for Psychological Distress and BC Risk Perception Measures at Three Assessment Points for the BBB Group ($n = 100$)

Subscale	Initial interview	Follow-up		$F(2, 88)^a$
		4-month	8-month	
CES-D-Total				0.17
M	11.4	11.6	11.0	
SD	10.5	11.6	12.2	
POMS-Total				1.31
M	43.6	45.9	42.1	
SD	24.3	27.7	27.8	
IES-Intrusion				7.27***
M	8.0 _{b,c}	5.9 _b	5.2 _c	
SD	8.2	7.5	7.1	
IES-Avoidance				9.02***
M	10.5 _{b,c}	7.4 _b	7.2 _c	
SD	9.6	8.8	8.7	
BC-Worry ^b				1.81
M	1.4	1.5	1.3	
SD	1.2	1.1	1.2	
BC-Worry Impact ^b				1.19
M	2.5	2.4	2.1	
SD	2.4	2.1	2.4	
Personal BC Risk ^b				0.77
M	32.6	33.5	35.4	
SD	22.7	22.6	25.0	
Typical BC Risk ^b				0.40
M	35.4	33.6	34.2	
SD	20.0	19.0	19.3	
Comparative BC Risk ^{b,c}				0.92
M	2.7	0.1	-1.1	
SD	19.7	19.8	21.1	

Note. Subscript letters indicate pairs of means that are significantly different ($p < .05$) from each other. BC = breast cancer; BBB = benign breast biopsy; CES-D = Center for Epidemiologic Studies Depression Scale; POMS = Profile of Mood States; IES = Impact of Events Scale.

^a Associated with value of Wilks's lambda in repeated-measures analysis of variance. ^b Analyses based on $n = 68$. ^c Calculated as Typical BC Risk minus Personal BC Risk.

*** $p \leq .01$.

Table 5
Multiple Regression Analysis of Change in IES Scores for the
BBB Group Following the Initial Interview ($n = 100$)

Variable	IES-Intrusion		IES-Avoidance	
	β	sr^2	β	sr^2
Initial IES score	.66***	.280	.62***	.221
Education	.21**	.026	.14	.012
Age at interview	-.21	.014	-.06	.001
Lifetime Risk for BC ^a	-.28*	.019	-.20	.009
Race ^b	.13	.014	.09	.007
No. FDRs with BC ^d	.20	.012	.11	.003
Social support	.15*	.017	.19**	.028
Perceived BC Risk	-.16*	.020	-.20**	.033
LOT-Total	.06	.003	-.01	.000
MBSS-Monitor	-.11	.011	-.03	.001
Lot \times Monitor	.05	.002	-.02	.000
Full model statistics				
Multiple R	.666		.630	
Multiple R ²	.443		.397	
F(11, 88)	6.37***		5.27***	

Note. Change scores calculated as initial level minus 4-month follow-up level. IES = Impact of Events Scale; BBB = benign breast biopsy. β = standardized beta coefficient for full, 11-variable model; sr^2 = squared semi-partial correlation; BC = breast cancer; FDR = first-degree relative; LOT = Life Orientation Test; MBSS = Miller Behavioral Styles Scale.

^a From Benichou (1993). ^b Coded as 1 = Caucasian, 2 = other. ^d Defined as number of FDRs with breast cancer.

* $p < .10$. ** $p < .05$. *** $p < .01$.

Discussion

Results provide support for our hypothesis that BBB may have a negative psychological impact. Specifically, comparison of the BBB and HC groups at the initial interview indicated that the BBB group evidenced significantly higher IES-Intrusion and IES-Avoidance scores (see Table 2). Group differences on both IES indices were in the range of 0.5 *SD*—a reasonably large effect. To place our IES scores in context, our mean Intrusion and Avoidance scores at the initial interview of approximately 8.0 and 10.5, respectively, are a bit lower than the mean Intrusion (11.1) and Avoidance (12.8) scores found in a sample of BC survivors a mean of 2 years after completion of BC treatment (Cordova, Cunningham, Carlson, & Andrykowski, 2001).

In contrast to our findings for the IES, no differences between the BBB and HC groups were found at the initial interview for scores on the POMS and CES-D. This apparent discrepancy might be resolved by considering the specificity of distress assessed by these instruments. The POMS and CES-D are generic measures of distress because they are not keyed to assess distress associated with any specific stressor. In contrast, the IES, as used in this study, can be considered a measure of BC-specific distress or preoccupation. In particular, the IES measured distress associated with "the possibility that you will develop BC in your lifetime." Because BBB is likely to engender anxiety regarding personal risk for BC, it is not at all surprising that the IES appeared to be highly sensitive to the impact of BBB, whereas generic measures of depressive symptoms (CES-D) and mood disturbance (POMS) were not. Given this rationale, however, it is puzzling that signif-

icant group differences were not found on the BC-Worry and BC-Worry Impact measures. However, these were fairly crude one- and two-item indices, respectively. The failure to obtain group differences on these measures might be attributable to poor measurement rather than the absence of true differences between the BBB and HC groups. Considered together, it seems fair to conclude that the experience of BBB may only increase BC-specific distress or preoccupation. The extent to which this increased BC-specific distress has an impact on quality of life more generally is not known, however, and might be a focus for future research.

Examination of the temporal trajectory of BC-specific distress or preoccupation within the BBB group indicated that distress declined over time (Table 4). Significant declines in IES scores were evident between the initial and 4-month follow-up interview, with no further significant declines evident after that. It is important to note, however, that although BC-specific distress levels 4 to 8 months after biopsy are lower relative to those evidenced in the immediate aftermath of BBB (i.e., at the initial interview), BC-specific distress is still significantly elevated over normal, pre-BBB levels. *t*-test comparison of IES-Avoidance and IES-Intrusion scores for the BBB group at the 4- and 8-month assessments with those of the HC group at the initial interview revealed significant group differences (all $ps < .05$). Whether BC-specific distress ultimately returns to a baseline, pre-BBB level is not known because follow-up in the present study extended only to 8 months post-BBB. However, even if distress levels do indeed eventually return to normal, that distress remains significantly elevated for at least 8 months following BBB is not trivial. From a quality-of-life standpoint, our findings suggest that consideration be given to identifying ways to help women manage the distress generated by BBB.

In general, our results are consistent with those of earlier studies that have found elevated levels of distress following BBB (Brett et al., 1998; Deane & Degner, 1998; Lindfors et al., 1998). Our results are also consistent with the single study that has examined the course of distress following BBB in suggesting that distress declines over time (Brett et al., 1998). Again, however, it is critical to note that the potential negative impact of BBB was evident only for IES scores. No significant differences between the BBB and HC groups and no significant evidence of change over time were apparent when CES-D or POMS scores were considered. The methodological implications of this are straightforward: A comprehensive understanding of the psychological impact of a particular stressful event is facilitated by inclusion of both generic and stressor-specific measures. In this case, inclusion of only generic measures of distress in our assessment protocol would have resulted in a quite different conclusion regarding the psychological impact of BBB. One might note that our recommendation here is similar to that regarding use of a modular approach to quality-of-life assessment (Aaronson, 1991). That is, consideration of both generic and disease-specific measures is necessary to yield a comprehensive view of quality of life.

In contrast to the apparent impact of BBB on BC-specific distress or preoccupation, our data suggest that perceptions of BC risk were largely unaffected by BBB. No significant differences were found between the BBB and HC groups at the initial interview with respect to perceptions of either their personal risk for BC or the typical woman's risk for BC (see Table 2). Furthermore,

in the BBB group, neither measure of BC risk perception changed significantly during the 8-month follow-up period, and intercorrelations among BC risk estimates were fairly high, in the .60 to .80 range, across the different points of assessment. Because ours is the first study to examine how BBB affects BC risk perceptions, these results require replication before firm conclusions can be drawn.

As hypothesized, optimism and informational coping style were associated with response to BBB. However, the hypothesized main effect relationships between these dispositional characteristics and distress after BBB were not found. Rather, results suggested an interaction between these two variables with regard to post-BBB distress (Figure 1). Specifically, the hypothesized relationship between a monitoring coping style and greater post-BBB distress was most evident in the context of low optimism. A monitoring coping style was much less strongly associated with BC-specific distress when optimism was high. Also, it is critical to note the interaction between optimism and a monitoring coping style was evident only in the BBB group. This was evidenced by the significant Monitor \times Lot \times Group interaction. (Table 3 and Figure 1).

Our results are consistent with the MPM insofar as informational coping style was associated with BC-specific distress only in the BBB group. This supports the MPM's contention that the effects of informational coping style on cognition, affect, and behavior are evident primarily under conditions of threat, in this case, BBB (Miller, 1995; Miller, Rodelet, et al., 1996). Our results also support the broader conceptualization of response to threatening health events provided by the cognitive-social health information processing model (C-SHIP; Miller, Shoda, & Hurley, 1996). In part, the C-SHIP model posits that the general tendency of monitors to amplify threat both cognitively and emotionally can be modified by other dispositional characteristics. In essence, the C-SHIP model suggests monitoring subtypes may exist. In particular, optimism is suggested as a dispositional characteristic that may moderate the monitor's typical response to a threatening health event (Miller, 1995; Miller, Mischel, O'Leary, & Mills, 1996). Because of their general expectancy for positive outcomes, optimists might avoid the cognitive and emotional amplification of threat associated with a monitoring style. Thus, monitors with high optimism may be less prone to react with distress when facing a threatening health event. Our finding of a significant LOT \times Monitor interaction is clearly consistent with this thesis.

In addition to the interaction of optimism and informational coping style, education and, to a lesser extent, family history of BC were predictive of IES scores in the BBB group (Table 3). Women with less education evidenced higher IES-Intrusion and IES-Avoidance scores at the initial interview, whereas women with a history of BC in one or more FDRs evidenced higher IES-Avoidance scores only. In addition, higher perceptions of personal BC risk and poorer social support at the Initial Interview were linked to smaller declines in IES scores over the 8 months following BBB (Table 5). Although specific hypotheses were not advanced, none of these findings are surprising. Both education and social support can serve as coping resources (Hobfoll, 1989), mitigating the negative impact of BBB. Alternatively, more educated women might receive more information and explanation from physicians and clinic staff and this may serve to minimize distress following BBB. Women with a family history of BC are likely to believe they are at greater risk for breast cancer. Indeed,

women with one or more FDRs with BC reported significantly higher perceptions of personal BC risk at the initial interview relative to women without a family history of BC (41.5% vs. 26.8%, $p < .05$). Undergoing BBB is likely to further heighten this sense of vulnerability and personal risk, resulting in elevated and more persistent BC-specific distress. Finally, our finding that higher personal BC risk estimates were associated with smaller declines in IES-Total and IES-Avoidance subscale scores is consistent with our previous research linking higher personal BC risk estimates to greater risk of nonadherence, with recommendations for clinical follow-up after BBB (Andrykowski et al., 2001).

Although we believe this report is the most comprehensive examination to date of psychological response to BBB, several limitations of the research should be noted. First, our sample was 90% Caucasian, and replication of our findings in a racially and ethnically more diverse sample would be prudent. Second, there is some suggestion that minority women and women with elevated perceptions of personal BC risk at the initial interview were less likely to complete all study assessments. As a result, caution is advised in generalizing study results to all women undergoing BBB. Third, the lack of a baseline assessment prior to BBB limits the ability to draw firm conclusions about the causal impact of BBB. Although inclusion of our matched HC group suggests that BC-specific distress is elevated as a result of BBB, differences between the HC and BBB groups at baseline could be due to some unmeasured factor and not directly attributable to BBB. Use of a true prospective design would be advised in future studies. Fourth, although our HC group allowed some insight into "baseline" levels of our outcome variables, this group may not have been the optimal control group for this setting. Inclusion of a group of women undergoing BC screening and receiving a "normal" result would have yielded a better perspective upon the psychological impact of BBB. In particular, this group could shed light on whether BC-specific distress or preoccupation might be temporarily elevated in these women as well, simply as a function of the screening process itself. Fifth, the large number of analyses conducted and the less-than-optimal ratio of predictor variables to sample size (i.e., $< 10:1$) suggest that further replication of our findings is necessary. Finally, we focused on the BC screening setting, and our findings may not be generalizable to screening for other cancers.

In conclusion, results suggest that the experience of breast biopsy may produce increased levels of BC-specific distress, even when no malignancy is found. Significantly, distress remains elevated at least 8 months after BBB. Women likely to evidence elevated and/or persistent distress following BBB can be identified by a combination of dispositional (optimism, monitoring coping style), clinical (family history of breast cancer), cognitive (perceptions of personal BC risk), social (social support), and demographic (education) variables. Other research suggests that breast self-examination practices may be altered after BBB (Haefner, Becker, Janz, & Rutt, 1989; Janz, Becker, Haefner, Rutt, & Weissfeld, 1990), and elevated distress and perceptions of personal BC risk after BBB are associated with nonadherence to recommendations for clinical follow-up of BBB (Andrykowski et al., 2001). Thus, reactions to BBB may have quality-of-life as well as health behavior implications. Although the potential negative impact of BBB does not appear to be of sufficient magnitude to recommend reexamination of guidelines for its use, we do believe that addi-

tional examination of its negative impact is warranted. Rather than reducing use of biopsy in the evaluation of breast lesions, we suggest that attention be devoted to the development of brief, psychoeducational interventions to enhance post-BBB psychological and behavioral outcomes. Such interventions could be based on similar efforts in related settings (Lerman et al., 1995; Miller et al., 1997).

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Running Head: RELATIONSHIP OF CATASTROPHIZING TO FATIGUE

Relationship of Catastrophizing to Fatigue
Among Women Receiving Treatment for Breast Cancer

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In press, Journal of Consulting and Clinical Psychology

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Abstract

This study examined the relationship of catastrophizing to fatigue in 80 women receiving chemotherapy (CT) or radiotherapy (RT) for treatment of early stage breast cancer. Findings revealed expected relationships between catastrophizing and fatigue among women receiving RT but not CT. Among RT patients, those high in catastrophizing reported significantly greater fatigue than those low in catastrophizing; among CT patients, differences in fatigue based on level of catastrophizing were not significant. Likewise, catastrophizing was found to account for significant variability in subsequent reports of fatigue among RT patients but not CT patients. These findings extend research on catastrophizing beyond previously studied relationships with pain and are consistent with the view that, as the inherent symptom-producing potential of treatment decreases, psychological factors play a greater role in patients' experience of symptoms.

Relationship of Catastrophizing to Fatigue Among Women

Receiving Treatment for Breast Cancer

Fatigue has been described as the most prevalent symptom of cancer treatment (Winningham et al., 1994). This assertion is supported by surveys indicating that more patients report fatigue during treatment than other common symptoms such as pain or nausea (Greene, Nail, Fieler, Dudgeon, & Jones, 1994; Longman, Braden, & Mishel, 1996). Although common, the experience of treatment-related fatigue varies considerably from patient to patient (Berger 1998; Jacobsen, Hann, Azzarello, Horton, Balducci, & Lyman, 1999; Smets et al., 1998).

The current study examined the possibility that reliance on catastrophizing might explain differences in fatigue among patients undergoing cancer treatment. Catastrophizing has been defined as a cognitive process characterized by a lack of confidence and an expectation of negative outcomes (Sullivan & D'Eon, 1990). We chose to focus on catastrophizing for two reasons. First, a considerable body of research has documented a relationship between catastrophizing and the experience of pain, another symptom with aversive properties (Sullivan et al., 2001). Second, preliminary evidence suggests a relationship between catastrophizing and the experience of fatigue in cancer patients. We previously showed that greater use of catastrophizing is associated with more severe fatigue in women who had completed chemotherapy (CT) for breast cancer (Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998), as well as more severe and disruptive fatigue in women who were undergoing or had completed bone marrow transplantation, CT, or radiotherapy (RT) for breast cancer (Jacobsen, Azzarello, & Hann, 1999). To the best of our knowledge, these are the only studies to have examined the relation of catastrophizing to fatigue in cancer patients.

The current study was designed to address several limitations of our prior research. One limitation was the use of cross-sectional study designs, which does not permit a consideration of the temporal predictive value of catastrophizing in relation to fatigue. A second limitation was the absence of a sample restricted to women currently undergoing treatment for breast cancer. This feature obscures an understanding of the importance of catastrophizing during the active treatment period when fatigue may be of greater intensity (Geinetz et al., 2001; Irvine, Vincent, Graydon, & Bubela, 1998). A third limitation was the inclusion of women receiving different types of treatment in insufficient numbers to perform adequate tests of possible treatment-related differences in the relationship between catastrophizing and fatigue. This issue merits examination since studies of women who have completed treatment for early stage breast cancer suggest that administration of CT may result in greater fatigue than administration of RT (Bower, Ganz, Desmond, Rowland, Meyerowitz, & Belin, 2000; Woo, Dibble, Piper, Keating, & Weiss, 1998).

The current study addressed these limitations through the use of a prospective longitudinal design in which similar numbers of women with early stage breast cancer scheduled to receive CT or RT were assessed before the start of treatment and, again, at the end of treatment. The primary aim of the study was to test the hypothesis that greater use of catastrophizing in response to fatigue would be related to greater fatigue severity and disruptiveness. Additional aims were to identify the ability of catastrophizing to predict subsequent reports of fatigue and examine the possible interactive effects of type of treatment and level of catastrophizing on the experience of fatigue. With regard to predictive ability, we sought to determine the degree to which catastrophizing at treatment onset explained variability in subsequent fatigue controlling for fatigue at treatment onset. With regard to interactive effects, we sought to determine if the

impact of catastrophizing differed by type of treatment. Based on prior research (Andrykowski & Gregg, 1992), we speculated that a psychological variable such as catastrophizing might play a greater role in the experience of fatigue among patients receiving the less inherently fatiguing of the two treatments (i.e., RT).

Methods

Participants were women scheduled to be treated with CT or RT for early stage breast cancer at the Moffitt Cancer Center or the Markey Cancer Center. Eligibility criteria were that participants: a) be at least 18 years of age, b) have no documented or observable psychiatric or neurological disorders that would interfere with study participation (e.g. dementia, psychosis), c) be able to speak and read standard English, d) have no history of cancer other than basal cell skin carcinoma, e) be diagnosed with stage 0, 1 or 2 breast cancer, f) have been treated surgically with lumpectomy or mastectomy, g) be scheduled to receive a minimum of 4 cycles of CT following surgery or be scheduled to receive RT following surgery, h) have no prior history of treatment with either CT or RT, i) have no other chronic or life-threatening diseases in which fatigue is a prominent symptom (e.g. AIDS, multiple sclerosis, chronic fatigue syndrome), and j) sign an informed consent form approved by the University of South Florida or the University of Kentucky.

Eligibility was determined by chart review and consultation with the attending physician. Those women who provided informed consent completed a pre-treatment questionnaire on the day of their first clinic visit for CT or RT. A follow-up questionnaire was administered during the last scheduled visit for CT or RT. Of 100 women considered eligible and asked to participate, 90 accepted. Following consent, 8 women (8%) became ineligible (due to change in treatment plans or decision to complete treatment elsewhere) and 2 (2%) elected to discontinue

participation before completing the follow-up assessment. All subsequent analyses are based on the 80 women who provided both baseline and follow-up data.

Demographic data were obtained at the pretreatment assessment through use of a standard self-report questionnaire. Medical charts were reviewed in order to obtain information about disease and treatment characteristics. Fatigue was assessed at both the pre-treatment and follow-up assessments using the Fatigue Symptom Inventory (FSI; Hann et al., 1998). As in prior research (Broeckel et al., 1998), analyses focused on items assessing fatigue severity and fatigue disruptiveness. Participants rated their average level of fatigue severity in the past week on an 11-point scale (0 = not at all fatigued, 10 = as fatigued as I could be). They rated perceived disruptiveness on 11-point scales (0 = no interference, 10 = extreme interference) that asked about the degree to which fatigue interfered with general level of activity, ability to bathe and dress, normal work activity, ability to concentrate, relations with others, enjoyment of life, and mood in the past week. These ratings were summed to yield a total disruptiveness score ($\alpha = .92$ to $.94$). Previous research has demonstrated the reliability and validity of FSI severity and disruptiveness scores in women with breast cancer (Broeckel et al., 1998; Hann et al., 1998). Catastrophizing was assessed at the pre-treatment assessment using the 10-item Fatigue Catastrophizing Scale (FCS; Jacobsen, Azzarello, et al., 1999). Respondents rated on five-point scales (1 = never true, 5 = all of the time true) how often each item is true for them when they have experienced fatigue (e.g., "I find myself expecting the worst when I'm fatigued"). A total score was derived by computing the mean of the 10 ratings ($\alpha = .85$). Previous research has shown that higher scores on the FCS are associated with concurrent reports of more severe fatigue in women who were undergoing or had completed treatment for breast cancer (Broeckel et al., 1998; Jacobsen, Azzarello, et al., 1999).

Results

The 80 participants ranged in age from 32 to 78 years ($M = 55.3$; $SD = 10.0$). The majority were white (95%), married (83%), and reported a household income of at least \$40,000 per year (64%). Forty-one percent were college graduates and 67% were post-menopausal at treatment initiation. Seven percent had Stage 0 disease, 53% had Stage 1 disease, and 40% had Stage 2 disease. Eighty-two percent had undergone lumpectomy, 14% had undergone mastectomy, and 4% had undergone both lumpectomy and mastectomy. Fifty-three percent received CT and 47% received RT during the course of the study. With one exception (a patient who received 309 mg of doxorubicin and no cyclophosphamide), all CT patients received a regimen that include both doxorubicin (range = 368 to 562 mg) and cyclophosphamide (range = 3640 to 5500 mg). With one exception (a patient who received 3900 cGy of radiation over 15 treatments), all RT patients received between 5000 and 6640 cGy of radiation over 25 to 36 treatments.

Preliminary analyses indicated that women treated with RT were significantly older ($M = 58.5$, $SD = 9.7$) than women treated with CT ($M = 52.5$, $SD = 9.7$; $p < .01$). Due to the inherent nature of CT and RT, the interval between the pre-treatment and follow-up assessments also differed significantly between treatment groups. This interval averaged 42.5 days ($SD = 8.9$; range = 20-61) for the RT group versus 100.5 days ($SD = 44.3$; range = 61-187) for the CT group ($p < .001$). Also as expected, women treated with RT were significantly more likely to have undergone lumpectomy than mastectomy ($p = .001$) and to have earlier stage disease ($p = .001$) than women treated with CT (see Table 1). The groups did not differ significantly with regard to race/ethnicity, marital status, education, income, or menopausal status (p values $> .05$).

Correlational analyses were conducted to examine the relation of demographic and clinical variables to catastrophizing and fatigue severity and disruptiveness. As shown in Table 2, the

only demographic or clinical variable to yield a significant correlation was educational level. Specifically, a lower educational level was associated with greater fatigue severity and disruptiveness at the pre-treatment assessment ($p < .05$). Educational level also demonstrated a marginally significant negative correlation with fatigue severity ($p = .08$) and disruptiveness ($p = .07$) at the follow-up assessment.

In order to examine the impact of catastrophizing on fatigue and explore possible interactive effects between catastrophizing and type of treatment, patients' ratings of their average fatigue severity for the past week were entered into a 2 (Time – pretreatment, follow-up) \times 2 (Treatment – CT, RT) \times 2 (Catastrophizing – low, high) repeated measures analysis of variance design. FCS scores were dichotomized into high and low groups based on the sample median (≤ 1.3 = low; ≥ 1.4 = high). The resulting groups differed significantly in level of catastrophizing ($t[78] = 11.75, p < .0001$). Education was included as a covariate based on its observed relation to fatigue severity. With regard to main effects (see Table 3), significant results ($p < .05$) were obtained for Time, Treatment, and Catastrophizing. With regard to interaction effects, there was no evidence of a significant ($p < .05$) Time \times Treatment \times Catastrophizing interaction or a Time \times Treatment interaction. However, as shown in Table 3, Catastrophizing did interact with Treatment to influence level of fatigue severity ($p < .001$).

The Treatment \times Catastrophizing interaction is illustrated in Figure 1. Visual inspection of mean scores and simple effects analyses indicated that, among patients administered CT, there was little difference in fatigue severity based on level of catastrophizing, $F(1,76) = 0.14, p > .05$. In contrast, among patients administered RT, those high in catastrophizing reported more severe fatigue than those low in catastrophizing, $F(1,76) = 13.21, p < .001$. Additional comparisons indicated that fatigue severity in RT patients low in catastrophizing was less than that reported

by CT patients either low or high in catastrophizing, $F(1, 76) = 8.06, p < .01$ and $F(1, 76) = 10.21, p < .01$. However, fatigue severity in RT patients high in catastrophizing did not differ from that reported by CT patients either low or high in catastrophizing, $F(1, 76) = .74, p > .05$ and $F(1, 76) = .24, p > .05$.

The same $2 \times 2 \times 2$ repeated measures analysis of variance, with education included as a covariate, was conducted using patients' fatigue disruptiveness scores as the dependent variable. As with fatigue severity, there were significant main effects ($p < .05$) for Time, Treatment, and Catastrophizing and a significant interaction ($p < .05$) between Treatment and Catastrophizing (see Table 4). The pattern of mean differences corresponding to these significant effects was similar to that observed for fatigue severity.

Hierarchical regression analyses were conducted to identify the ability of catastrophizing to predict follow-up levels of fatigue severity and disruptiveness. Pre-treatment fatigue scores were entered into the equations on the first step in order to transform the dependent variables into residualized change scores, followed by pre-treatment catastrophizing scores on the second step. In light of the significant Treatment \times Catastrophizing interactions reported above, separate analyses were conducted for CT and RT patients. Among CT patients, catastrophizing did not explain additional significant variability in follow-up fatigue severity or disruptiveness scores. After accounting for pretreatment levels, catastrophizing among CT patients accounted for 1% of the variability in fatigue severity at ($p = .64$) and 1% of the variability in fatigue disruptiveness at follow-up ($p = .61$). In contrast, catastrophizing explained significant additional variability in follow-up fatigue severity and disruptiveness among RT patients. After accounting for pretreatment levels, catastrophizing among RT patients accounted for 16% of the variability in

fatigue severity ($p = .003$) and 22% of the variability in fatigue disruptiveness at follow-up ($p = .0006$).

Discussion

Results from the current study supported the hypothesis that greater catastrophizing would be related to greater fatigue in women undergoing treatment for breast cancer. This conclusion was qualified, however, by the presence of significant interaction effects between level of catastrophizing and type of treatment. Examination of these effects indicated that catastrophizing demonstrated expected relationships with fatigue severity and disruptiveness for RT patients but not CT patients. Similarly, levels of catastrophizing significantly predicted subsequent levels of fatigue severity and disruptiveness for RT patients but not CT patients.

Prior to conducting the study analyses, we had speculated about possible interactive effects between type of treatment and level of catastrophizing. The observed Treatment x Catastrophizing interaction was consistent with the view that the impact of catastrophizing would be greater among patients receiving the less inherently fatiguing of the two treatments. Among patients receiving RT (the less fatiguing treatment), those high in catastrophizing reported significantly greater fatigue severity and disruptiveness than those low in catastrophizing. Among patients receiving CT (the more fatiguing treatment), levels of fatigue severity and disruptiveness were found to be similar in patients high and low in catastrophizing. The magnitude of differences in fatigue between RT patients high and low in catastrophizing appeared to be substantial. Levels of fatigue severity and disruptiveness in RT patients high in catastrophizing were on a par with levels observed in CT. In contrast, levels of fatigue severity and disruptiveness among RT patients low in catastrophizing were significantly less than those reported by CT patients. Additional results regarding the relative importance of catastrophizing

in predicting the subsequent experience of fatigue among CT and RT patients provided further evidence of treatment-related differences in the impact of catastrophizing.

These findings underscore the importance of considering treatment factors in attempts to understand psychological influences on symptom reporting. A similar pattern of results has been reported in research on the contribution of anxiety to reports of posttreatment nausea in patients receiving CT for cancer. CT regimens are known to differ considerably in their pharmacological potential to produce nausea and vomiting (Hesketh et al., 1997). Based on these considerations, Andrykowski and Gregg (1992) hypothesized that anxiety would have a greater impact on the experience of posttreatment nausea among patients receiving regimens with low to moderate emetic potential than patients receiving regimens with high emetic potential. With increasing emetic potential, the impact of pharmacological variables would presumably override the contribution of psychological variables. Consistent with predictions, results showed that the strength of the relationship between anxiety and posttreatment nausea was inversely related to the emetic potential of the CT regimen that patients received. Preliminary evidence suggests that, in addition to their emetic potential, CT regimens differ in their fatigue-inducing potential (von Pawel et al., 1999). If confirmed, then studies seeking to examine the relationship of psychological variables to chemotherapy-related fatigue should include some consideration of the fatigue-inducing potential of the regimens administered. The present study did not provide an opportunity to examine this issue, since patients in the CT group all received regimens containing cyclophosphamide and doxorubicin.

The conclusion that differences in the impact of catastrophizing were attributable to differences in the type of treatment must be considered provisional in light of the fact that patients were not randomized to receive CT or RT. Indeed, the two treatment groups differed on

several demographic and clinical variables including age, type of surgery, and disease stage.

Two features should be noted in this regard. First, differences on these variables are not unexpected in light of current medical consensus (National Institutes of Health Consensus Development Panel, 2001) and current patterns of clinical practice (Hebert-Croteau, Brisson, Latreille, Blanchette, & Deschenes, 1999). Second, none of these variables was related significantly to catastrophizing or fatigue severity and disruptiveness in the present study. These features increase confidence that the observed interactions between catastrophizing and type of treatment are not confounded by relationships with other variables.

The conclusion that differences in fatigue among RT patients are specific to catastrophizing must also be considered provisional. In both clinical and experimental research on pain, catastrophizing has been shown to be significantly correlated with depression (Sullivan, Bishop, Pivik, 1995; Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998). Although several studies indicate that the relation between catastrophizing and pain is independent of depression (Sullivan et al., 1998; Walsh, Smith, McGrath, 1998), this issues has yet to be addressed for fatigue.

Findings from the present study suggest several directions for future research. One direction would be to determine whether catastrophizing about fatigue during the active treatment period is a risk factor for persistent fatigue following treatment completion. Although several studies have documented heightened fatigue in women previously treated with CT or RT for early stage breast cancer (Broeckel et al., 1998; Andrykowski, Curran, & Lighter, 1998), the mechanisms underlying this "off-treatment" fatigue remain obscure. Research on chronic fatigue in other medically ill populations suggests that catastrophizing might promote behaviors (such as avoidance of physical activity) that could perpetuate fatigue independent of the original precipitating stimulus (Wessely, Hotopf, & Sharpe, 1998).

Another future direction would be to determine if current findings are generalizable to other populations of cancer patients. In particular, it would be important to learn about catastrophizing and its relationship to fatigue in male cancer patients since all previous research on this topic has been conducted with female cancer patients. The possible presence of gender differences is supported by research on catastrophizing in relation to pain. Several studies have found that women score higher than men on measures of catastrophizing and that these differences mediate observed gender differences in pain reports and pain behavior (Keefe, Lefebvre, Egert, Affleck, Sullivan, & Caldwell, 2000; Sullivan, Tripp, & Santor, 2000).

Results regarding catastrophizing also provide support for developing a cognitive-behavioral model of fatigue in cancer patients. Research on chronic pain suggests that certain behaviors, such as activity reduction (Turner & Clancy, 1986) and solicitous actions on the part of others (Sullivan, Tripp, & Santor, 2000), are related to catastrophizing and may serve to further exacerbate the pain experience. Greater inactivity has been shown to be associated with greater fatigue in women being treated for breast cancer (Berger, 1998), however, the relationship of inactivity to catastrophizing has yet to be investigated in cancer patients.

Still another future direction would be to determine the extent to which catastrophizing represents a general versus a specific response to the experience of symptoms. Research indicates that cancer patients typically experience multiple symptoms (such as nausea, pain, and fatigue) concurrently during the course of their treatment (Dodd, Miaskowski, & Paul, 2001). This situation provides a relatively unique opportunity to examine whether catastrophizing occurs on a symptom-specific basis or whether it represents a more generalized response to aversive symptoms. If the latter is true, it would suggest that catastrophizing may have a broad impact on quality of life during cancer treatment.

Finally, results of the current study provide support for exploring new ways to intervene to reduce fatigue in women undergoing treatment for early stage breast cancer. Previous research has demonstrated that interventions based on cognitive-behavioral models can lead to reductions in catastrophizing which, in turn, are associated with better adjustment to chronic pain (Jensen, Turner, & Romano, 2001). These findings raise the possibility that similar interventions may be effective against fatigue, particularly in women receiving RT for breast cancer.

In conclusion, the present study demonstrates the importance of considering treatment factors in attempts to understand psychological influences on symptom reports. Findings showing relationships between catastrophizing and fatigue among RT patients but not CT patients are consistent with the view that, as the inherent symptom-inducing potential of treatment decreases, psychological factors play a greater role in patients' experience of symptoms. The current findings also extend our understanding of catastrophizing beyond its previously studied relationship to the experience of pain. Differences in fatigue related to catastrophizing among RT patients appeared to be substantial and should encourage further study of this phenomenon. In particular, it will be important to learn whether catastrophizing represents a general versus a specific response to the aversive consequences of cancer treatment and whether fatigue and other symptoms cancer patients experience can be relieved through the use of interventions designed to reduce catastrophizing.

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Table 1. Relation of Demographic and Clinical Variables to Treatment Group

Variable	Group		p ^a
	Chemotherapy N (%)	Radiotherapy N (%)	
Race/Ethnicity			
White	39 (49%)	37 (46%)	.36
Non-white	3 (4%)	1 (1%)	
Marital Status			
Married	35 (43%)	31 (39%)	.84
Not married	7 (9%)	7 (9%)	
Education			
College graduate	20 (25%)	13 (16%)	.22
Non-college graduate	22 (28%)	25 (31%)	
Household Income			
Over \$40,000	28 (38%)	23 (33%)	.57
Under \$40,000	10 (14%)	11 (15%)	
Menopausal Status			
Pre- or peri-	17 (22%)	9 (11%)	.13
Post-	25 (32%)	28 (35%)	
Surgery Type			
Lumpectomy Only	28 (35%)	38 (48%)	.001
Mastectomy	14 (17%)	0 (0%)	
Disease Stage			
Stage 0 or 1	12 (15%)	36 (45%)	.001
Stage 2	30 (38%)	2 (2%)	

Note: 8 participants declined to provide information about income and 1 participant declined to provide information about menopausal status.

^ap values are for chi-square tests or Fisher's exact tests of association.

Table 2. Relation of Demographic and Clinical Variables to Catastrophizing and Fatigue Severity and Disruptiveness

Variable	Catastrophizing	Pre-treatment Fatigue		Follow-up Fatigue	
		Severity	Disruptiveness	Severity	Disruptiveness
Age	-.17	-.05	-.10	-.05	-.09
Educational level	-.02	-.25*	-.22*	-.20	-.20
Income level	.15	-.06	-.13	-.12	-.09
Race/ethnicity (white=0/other=1)	-.03	-.17	-.15	-.11	-.11
Marital status (married=0/other=1)	.07	-.03	.10	.11	.11
Menopausal status (pre or peri=0/post=1)	-.09	-.01	-.03	-.04	.02
Surgery type (lumpectomy=0/mastectomy=1)	-.11	.07	-.01	.03	.04
Disease stage (0,1=0/2=1)	-.15	-.01	-.01	.02	.02
Treatment type (chemotherapy=0/radiotherapy=1)	.04	-.16	-.19	-.12	-.19
Recruitment location (Kentucky=0, Florida=1)	.01	.19	.19	.08	.05

Note: p values are for point-biserial or Pearson correlation coefficients.

* $p < .05$

Table 3. Repeated Measures Analysis of Variance of Fatigue Severity Scores

Effect	df	SS	MS	F
Between subjects				
Treatment	1	21.83	21.83	4.23*
Catastrophizing	1	38.26	38.26	7.42**
Treatment x Catastrophizing	1	24.89	24.89	4.83*
Residual	75	386.68	5.16	
Within subjects				
Time	1	38.26	38.26	18.70***
Time x Catastrophizing	1	0.00	0.00	0.00
Time x Treatment	1	0.28	0.28	0.14
Time x Catastrophizing x Treatment	1	3.31	3.31	1.62
Residual	75	153.43	2.05	

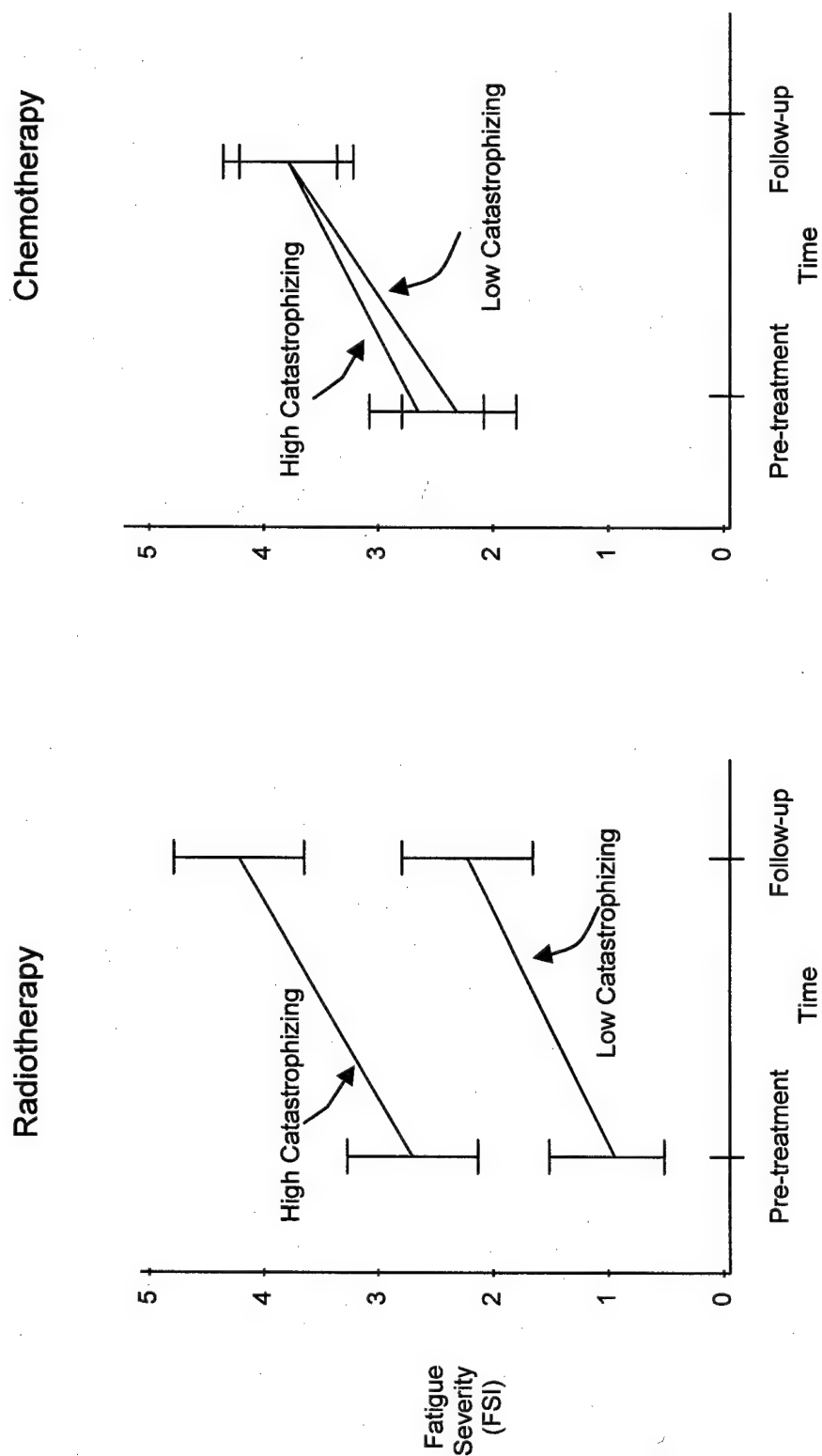
* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4. Repeated Measures Analysis of Variance of Fatigue Disruptiveness Scores

Effect	df	SS	MS	F
Between subjects				
Treatment	1	24.46	24.46	6.65*
Catastrophizing	1	25.58	25.58	6.96*
Treatment x Catastrophizing	1	16.26	16.26	4.42*
Residual	75	275.87	3.68	
Within subjects				
Time	1	38.26	38.26	18.70***
Time x Catastrophizing	1	0.00	0.00	0.00
Time x Treatment	1	0.28	0.28	0.14
Time x Catastrophizing x Treatment	1	3.31	3.31	1.62
Residual	75	153.43	2.05	

* $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1. Relationship of Level of Catastrophizing and Type of Cancer Treatment to Fatigue Severity



Running head: EMOTION AND ADJUSTMENT TO BREAST CANCER

The Role of Social and Dispositional Variables Associated with Emotional Processing in
Adjustment to Breast Cancer: An Internet-Based Study

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In press, Healthy Psychology

Abstract

Cognitive and emotional processing is seen as critical to successful adjustment to traumatic experiences, such as breast cancer. Cognitive and emotional processing can be facilitated by dispositional (e.g., emotional intelligence) and social-environmental (e.g., social support, social constraints) factors. Emotional intelligence is a dispositional characteristic conceptually linked to the identification and articulation of emotional states and is defined as the ability to understand, accurately perceive, and express emotions, as well as the ability to regulate emotions promoting emotional growth (Mayer & Salovey, 1997). Social constraints occur when others hinder the expression of trauma-related thoughts and feelings (Tait & Silver, 1989). This study investigated psychological adjustment as a function of emotional intelligence, social support, and social constraints in 210 breast cancer patients recruited via postings to internet-based breast cancer support groups. Respondents completed on-line measures of social support and constraints, emotional intelligence, and distress. Regression analyses indicated high social constraints and low emotional intelligence were associated with greater distress. Additionally, evidence suggested high emotional intelligence could buffer against the negative impact of an otherwise toxic social environment. Results support a social-cognitive processing model of adaptation to traumatic events, and suggest that consideration of emotional intelligence may broaden this model.

Key words: social-cognitive processing, emotional intelligence, internet research, breast cancer

The potential psychosocial impact of breast cancer diagnosis and treatment can be a stressful and traumatic event with long-term consequences (Moyer & Salovey, 1996). Recent conceptualizations of the experience of breast cancer suggest the utility of viewing psychological adaptation as a particular instance of how individuals adapt to stressful or traumatic events more generally (Andrykowski, Cordova, Studts, & Miller, 1998; Green et al., 2000). For example, theories of trauma adaptation suggest cognitive and emotional processing of a traumatic event are critical to long-term psychological adjustment (Creamer, Burgess, & Pattison, 1992). Cognitive and emotional processing is believed to be facilitated by expression of thoughts and feelings regarding the traumatic event in a supportive social context (Creamer et al., 1992). Recent work addressing emotional expression and adjustment to cancer suggests that coping through actively processing and expressing emotion leads to better long-term psychological adjustment (Stanton et al., 2000). Based upon this model of trauma adaptation, differences in distress after breast cancer diagnosis and treatment might be examined as a function of variables that might facilitate or impede cognitive and emotional processing of the breast cancer experience.

Social-cognitive processing theory (Lepore, 2001; Lepore & Helgeson, 1998) suggests that trauma-related distress may remain elevated if the individual fails to engage in suitable discussion of their thoughts and feelings regarding their traumatic experience. Cognitive and emotional processing might fail to occur because an individual lacks the skills or ability to appropriately identify, reflect upon, and express trauma-related thoughts and feelings. Certain dispositional characteristics might be important here. For example, individuals low in trait emotional expressivity (Stanton et al., 2000) or high in alexithymia (Taylor, Bagby, & Parker, 1991) might be less capable of engaging cognitive and emotional processing of trauma-related material. The sharing of thoughts, feelings, and meanings associated with the trauma experience is facilitated by a supportive social

environment. Thus, even when a person possesses the skills necessary for effective processing of their trauma experience, the lack of a supportive social environment may hinder this processing.

Based upon this analysis, both dispositional and social-environmental variables are critical to cognitive and emotional processing of trauma-related material and thus might be important in facilitating psychological adjustment following breast cancer diagnosis and treatment. Emotional intelligence is a dispositional characteristic conceptually linked to the ability to identify and articulate emotional states and may be related to emotional expression tendencies (Mayer & Salovey, 1993). Emotional intelligence is defined as the ability to accurately perceive, understand, and manage emotions (Salovey & Mayer, 1990). Individuals high in emotional intelligence should be better equipped to engage in the cognitive and emotional processing necessary for successful trauma adaptation. However, while conceptually intriguing, research linking emotional intelligence to trauma adaptation is quite limited at present. Salovey and colleagues (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) proposed that individuals higher in emotional intelligence would quickly recover from sustained negative affect and intrusive negative thoughts after exposure to graphic video footage from a trauma center. Results showed that individuals high in emotional intelligence were more attentive to their moods, had greater mood clarity, and were better able to engage in mood repair, demonstrating that greater ability to activate and modify feelings may lead to successful emotional processing of trauma related intrusive thoughts (Salovey et al., 1995). Exploration of the relevance of emotional intelligence to understanding adaptation to traumatic events, in general, or to the diagnosis and treatment of cancer, in particular, is clearly warranted.

Characteristics of the social environment critical to cognitive and emotional processing of distressing or traumatic experiences include the presence and extent of social support and social constraints. A supportive social environment that encourages sharing of thoughts, feelings, and meanings associated with traumatic events is crucial for successful long-term psychological

adjustment (Lepore, Silver, Wortman, & Wayment, 1996). Conversely, social constraints are defined as the hindrance of an individual's expression of trauma-related thoughts and feelings due to negative responses from others (Tait & Silver, 1989). The result may be interference with cognitive and emotional processing of the trauma experience and poorer psychological adjustment characterized by greater and/or more persistent trauma-related distress (Lepore et al., 1996).

Based upon the conceptual framework provided by a social-cognitive processing theory of adaptation to trauma (Lepore, 2001; Lepore & Helgeson, 1998; Lepore et al., 1996), the aim of this study is to examine the relationship between dispositional and social-environmental characteristics and psychological adjustment in women with breast cancer. It is hypothesized that: (1) breast cancer patients who report more social constraints will report more psychological distress; (2) breast cancer patients who report more social support will report lower psychological distress; and (3) breast cancer patients who are high in emotional intelligence will report lower psychological distress. In addition, we examine whether emotional intelligence interacts with characteristics of the social environment to influence distress levels. While low social support and high social constraints are expected to be linked to higher distress, we hypothesize that high emotional intelligence may enable an individual to overcome limitations of a poor social environment.

Method

Sample

Participants were members of five internet-based breast cancer support groups. To be eligible for inclusion in the study, a woman had to: (a) be ≥ 18 years; (b) be < 60 months post-diagnosis of breast cancer; (c) be able to read and understand English, (d) have internet access. Data was collected from all individuals who visited the study website and completed at least part of the survey. Only respondents who met eligibility criteria had their data used in final analyses.

Procedure

Permission was obtained from each internet support group to advertise the research study to their members. Upon receipt of permission, information regarding the study was posted on each group's website or was mailed electronically to each group's mailing list. Interested individuals accessed the survey by logging on to the study website.

Study Questionnaires

Demographic/medical information. Information regarding birth date, race/ethnicity, education, household income, marital status, and geographic residence was obtained. Information regarding date (month/year) of breast cancer diagnosis, disease stage at diagnosis, type of surgery, and adjuvant treatment received was also obtained.

Trait Meta-Mood Scale (TMMS). The TMMS (Salovey et al., 1995) is a 30-item dispositional measure of emotional intelligence. The TMMS is conceptually based on the emotional intelligence construct (Mayer & Salovey, 1993; Salovey & Mayer, 1990) and was developed by Salovey and colleagues to identify individual differences that characterize emotional intelligence (Salovey et al., 1995). The TMMS yields three subscale scores as well as a total composite score. Items are scored on a 5-point scale ranging from 'strongly disagree' to 'strongly agree'. The 'attention to feelings' subscale indexes the amount of attention individuals feel they give to emotions and includes items such as "I pay a lot of attention to how I feel." The 'clarity of feelings' subscale measures how clearly individuals feel they understand their emotions and includes items such as "I am usually very clear about my feelings." The 'mood repair' subscale measures the individuals ability to repair unpleasant moods or maintain pleasant ones. Items on this subscale include "I try to think good thoughts no matter how badly I feel." Only the TMMS-total score was used in data analyses in the present study. Coefficient α was .88 for the total score.

Impact of Events Scale (IES). The IES (Horowitz, Wilner, & Alvarez, 1979) is a 15-item measure of intrusive and avoidant cognition during the past week regarding a specific stressor. The IES yields a total score, and subscale scores for intrusion and avoidance. Coefficient α in the present study was .85 for the total score, .88 for the intrusion subscale, and .75 for the avoidance subscale.

Social Constraints Scale (SCS). The SCS (Lepore, 1997) is a 15-item measure of the extent the social environment inhibits expression of thoughts and feelings regarding a traumatic or stressful event. Coefficient α for the SCS in this study was .95.

Duke-UNC Functional Social Support Questionnaire (DUKE-SSQ). The DUKE-SSQ (Broadhead, Gehlbach, De Gruy, & Kaplan, 1988) was designed for use with medical populations and is an 8-item measure of satisfaction with the extent of functional social support received. A total score is computed and coefficient α in the present study was .88.

Hospital Anxiety and Depression Scale (HADS). The HADS (Zigmond & Snaith, 1983) measures anxiety and depression during the past week and was designed for patients with physical illness. The HADS provides subscale scores for depression and anxiety, with 7 items each. Coefficient α in the present study was .84 (anxiety subscale) and .83 (depression subscale).

Data Preparation and Statistical Analysis

Missing data constituted less than 1% of all items. Values for missing data were imputed using substitution of the sample mean. The criterion for statistical significance was set at .05.

Results

A total of 302 respondents completed the study. Of these, 40 (13%) had incomplete data and 52 (17.2%) were more than 60 months post-diagnosis. These 92 respondents were excluded from the study sample. The final study sample of 210 women had a mean age of 47.4 years ($SD=8.4$; range=22.4-68.5) and were a mean of 22.6 months after breast cancer diagnosis ($SD=15.2$; range=0.5-59.2). Disease stage at diagnosis was: Stage 0 ($n=17$, 8.1%), Stage I ($n=64$, 30.5%),

Stage II ($n=100$, 47.6%), Stage III ($n=25$, 11.9%), and stage IV ($n=5$, 1.9%). The majority of the sample had undergone either lumpectomy ($n=91$, 43.3%) or mastectomy ($n=94$, 44.8%), with 25 women (11.9%) having undergone lumpectomy and a mastectomy. Adjuvant therapy consisted of chemotherapy alone ($n=55$, 26.2%), radiotherapy alone ($n=27$, 12.9%), or both ($n=111$, 52.9%). Receipt of no adjuvant therapy was reported by 17 women (8.0%). Most respondents were from the U.S. ($n=167$, 79.5%). International respondents were primarily from Australia ($n=16$) and Canada ($n=14$). Demographic characteristics of the sample are shown in Table 1.

To test hypotheses regarding the relationship between current psychological adjustment and demographic, clinical, and psychosocial variables, four hierarchical regression analyses were performed. Dependent variables in these analyses included Depression and Anxiety scores from the HADS and Intrusion and Avoidance scores from the IES. In each regression analysis, an identical set of 10 independent variables, grouped into demographic, clinical, and psychosocial subsets, was employed. Demographic variables included age, years of education, and marital status (single vs. partnered). Clinical variables included months since diagnosis, surgery (lumpectomy vs. mastectomy), adjuvant therapy received (four ordinal groupings: no adjuvant therapy, radiation only, chemotherapy only, radiation and chemotherapy), and disease stage at diagnosis (0-IV). Psychosocial variables included scores for the TMMS, SCS, and DUKE-SSQ. Means and standard deviations for the major variables are shown in Table 2. Intercorrelations among the 10 predictor variables are shown in Table 3. Results of the regression analyses are shown in Tables 4 and 5.

The set of 10 predictor variables accounted for a significant portion of variance in each of our four distress indices ranging from 23% (IES-Intrusion) to 40% (HADS-Depression) of variance accounted for. For the most part, demographic and clinical variable subsets were not significantly associated with distress indices as addition of these subsets to the regression models did not yield a significant increment in variance accounted for. The lone exception was the 6% increment in

variance in accounted for by addition of the demographic variable subset to the regression model for HADS-Depression scores. While several individual demographic and clinical variables were significant predictors of one or more distress indices, few strong or consistent patterns were detected. Time since diagnosis was significantly associated with three of the four distress indices with greater time since diagnosis associated with less distress. However, the proportion of unique variance (square of semi-partial correlation coefficient – sr^2) accounted for by time since diagnosis was 3.3% or less for all four distress indices.

In strong contrast, the subset of psychosocial variables accounted for a significant increment in variance accounted for each of the four distress indices, even after demographic and clinical subsets had been accounted for. The increment in variance accounted for by the psychosocial variable subset ranged from 18% (IES-Intrusion) to 31% (HADS-Depression). Within the subset of psychosocial variables, SCS score was a significant predictor of all four distress indices, with greater social constraints associated with greater distress. The proportion of unique variance accounted for (i.e., sr^2) by SCS scores ranged from 6.9% (HADS-Depression) to 14.0% (IES-Intrusion). TMMS total score was a significant predictor of three distress indices (the lone exception was IES-Intrusion scores) with the proportion of unique variance accounted for ranging from 7.0% (HADS-Depression) to 12.5% (IES-Avoidance). In all cases, greater emotional intelligence was associated with less distress. Social support was less consistently associated with psychological adjustment as it was a significant predictor only in the regression model for HADS-Depression scores. In this model, higher social support was associated with lower HADS-Depression scores.

To examine whether emotional intelligence interacted with social constraints to influence current levels of distress, four additional regression models were constructed using the same four distress indices as dependent variables. For each model, a variable representing the interaction between emotional intelligence and social constraints (i.e., TMMS score multiplied by SCS score)

was created. The Emotional Intelligence by Social Constraints (EI x SC) interaction term was entered as a fourth step in the analyses described above. The EI x SC interaction was a significant predictor of HADS-Anxiety ($\beta = -.12$, $t(210) = -2.00$, $p < .05$) score. The incremental variance accounted for by the EI x SC interaction was 1.4%. The form of this interaction is graphically displayed in Figure 1. While reports of high social constraints are clearly associated with greater HADS-Anxiety scores, this effect is less pronounced among breast cancer patients with high emotional intelligence. This suggests that high emotional intelligence might buffer against the potential negative impact of a social environment characterized by high levels of social constraints.

An identical set of four hierarchical regression analyses were then conducted to test whether the Emotional Intelligence by Social Support (EI x SS) interaction also added to the prediction of distress. The EI x SS interaction was significant for the HADS-Depression model ($\beta = .15$, $t(210) = 2.62$, $p < .01$), and was associated with a 2.0% increment in variance. The form of the EI x SS relationship is shown in Figure 2. Again, while reports of low social support are clearly associated with higher HADS-Depression scores, this effect is less pronounced among individuals with high EI. This suggests that high emotional intelligence might buffer against the potential negative impact of a social environment characterized by low levels of social support.

Discussion

The results of the present study support a social-cognitive processing conceptualization of adjustment to breast cancer. We hypothesized that social and dispositional factors presumably associated with emotional processing and expression would be associated with reported distress in breast cancer patients. Consistent with our hypotheses, patients who reported low social constraints and evidenced higher emotional intelligence tended to report less distress.

Lepore's social-cognitive conceptualization of trauma adaptation (Lepore, 2001; Lepore & Helgeson, 1998; Lepore et al., 1996) posits the importance of a social environment which enables

the individual to express and discuss trauma-related cognitions and emotions. Individuals in this type of social environment would be expected to evidence better psychological adjustment (e.g., less distress) after a stressful or traumatic event. In the present study, reports of low social constraints were associated with reports of less distress. Participants who perceived that family and friends did not want to discuss their cancer experience, or indeed actively discouraged attempts at such discussion, were more depressed, anxious, and reported more breast cancer-related distress. On a "macro" level, the existence of social constraints upon discussion of a woman's breast cancer experience likely interferes with adequate cognitive and emotional processing, resulting in poorer psychological adjustment, in this case, greater distress.

On a more "micro" level, the existence of social constraints may motivate women to actively avoid thinking about their breast cancer experience, thus inhibiting cognitive and emotional processing of their experience. Prior research has shown a positive relationship between social constraints and avoidant behavior with regard to cognitive processing of cancer-related thoughts and feelings (Lepore & Helgeson, 1998). In the present study, social constraints were positively associated with IES-Avoidance scores suggesting that breast cancer patients who perceived social constraints were more likely to avoid thinking about or confronting aspects or reminders of their breast experience. The existence of social constraints may also serve to increase cancer-related intrusive ideation. In the present study, social constraints were positively associated with IES-intrusion scores. On the one hand, such intrusions can be functional as they can lead to activation and processing of the memory network, gradually reducing both the occurrence of intrusive ideation and psychological distress (Creamer et al., 1992). On the other hand, the occurrence of such intrusions in a socially constraining environment might be dysfunctional as the opportunity for appropriate cognitive and emotional processing is limited. In a socially constraining environment,

breast cancer-related intrusions may occur but may not be adequately "detoxified," resulting in persistent intrusive ideation and chronic distress.

In contrast to findings for the social constraints variable, support for our hypothesized relationship between social support and distress in breast cancer patients was much weaker. Of the four distress indices examined, the hypothesized inverse relationship between social support and psychological distress was evident only for HADS-Depression scores. Lepore suggests that social support and constraints are not the inverse of each other, and the correlation between these two variables can approach zero (Lepore, 1992). Were this the case, the stronger link between social constraints and distress in BC survivors observed in this study, relative to the link between social support and distress, might suggest social constraints is the more critical aspect of the social environment. However, social constraints and social support scores were correlated $-.48$ ($p < .001$) in our sample, raising the possibility that the apparent primacy of social constraints might be a statistical artifact rather than a true psychosocial phenomenon. While future research should sort this out, the present study is significant as it provides further evidence that social constraints is an element of the social environment that merits strong consideration in attempts to understand adaptation to stressful or traumatic events, in general, and cancer in particular.

Even when the social environment is appropriately supportive, some individuals might be dispositionally more or less capable of engaging in the emotional and cognitive processing presumed necessary for appropriate psychological adaptation to a stressful or traumatic event. Study results generally support our hypothesis that emotional intelligence, a dispositional characteristic related to attention, recognition, and regulation of emotion (Mayer & Salovey, 1993) would be associated with less distress in breast cancer patients. Indeed, we found greater emotional intelligence was significantly associated with less depression, anxiety, and breast cancer-related avoidance. Interestingly, we found some evidence to support our hypothesis that high emotional

intelligence may enable some individuals to overcome, to a degree, the limitations posed by a poor social environment. In both instances, the form of the interaction suggested that high emotional intelligence buffered against the potential negative impact of a toxic social environment, one either high in social constraints or low in social support.

Considered together, our findings support the view that emotional intelligence may play an important role in the process of psychological adaptation to breast cancer. Emotional intelligence may facilitate cognitive and emotional processing of the breast cancer experience by enhancing the ability to attend to, discriminate among, and regulate emotion. While not investigated in this study, emotional intelligence may also facilitate or impede cognitive and emotional processing by affecting critical aspects of the social environment. For example, women low in emotional intelligence may be less able to effectively identify, communicate and regulate their emotions and thus may be seen as irrational, demanding, or aversive by their social environment. The social environment might respond in a constraining fashion in order to limit discussion of a woman's breast cancer experience. Alternatively, women low in emotional intelligence might be less effective in eliciting social support or less capable of recognizing and responding to appropriately supportive responses from the social environment. While emotional intelligence, as conceptualized here and by others (Salovey et al., 1995), is primarily an intrapersonal construct, its impact upon the social (i.e., interpersonal) environment merits exploration.

As the role of emotional intelligence in psychological adaptation to cancer diagnosis and treatment has not been examined in prior research, our findings with regard to emotional intelligence clearly require replication and further elaboration. It must be recognized, however, that emotional intelligence is still in its infancy as a psychological construct. More recent conceptualizations suggest the emotionally intelligent individual is able to monitor, regulate and manage their own emotions as well as more accurately identify the emotions of others (Mayer,

Caruso, & Salovey, 1999; Mayer & Salovey, 1997). This emerging construal of emotional intelligence as possessing both intrapersonal and interpersonal dimensions may result in an even stronger connection between emotional intelligence and psychological adjustment to stressful or traumatic events. Future research involving the emotional intelligence construct should recognize that it is still evolving with regard to its definition and measurement and thus should strive to include the most appropriate and up-to-date measures.

The use of the internet as a research tool in health psychology is in its infancy. The internet enabled us to enroll a larger sample of breast cancer patients, and to do so more quickly, than would have been possible using traditional methods. Despite these economies, sample representativeness is a fundamental concern. Fortunately, the characteristics of our participants did not differ dramatically from those of participants in similar psychosocial studies of breast cancer. For example, clinical characteristics of our sample are comparable to those of other studies of breast cancer patients (Cordova, Cunningham, Carlson, & Andrykowski, 2001; Epping-Jordan et al., 1999). Furthermore, mean social support scores in the present study ($M=32.2$, $SD=6.5$) were similar to scores for women with stage I or II breast cancer recruited from cancer centers in a major metropolitan area ($M = 33.2$, $SD = 6.0$; Green et al, 2000). While mean social constraint scores in the present study ($M=31.3$, $SD=10.8$) were higher than social constraints scores from 70 women with stage I-III breast cancer ($M=26.6$, $SD=11.0$) recruited from a single site (Cordova et al., 2001), our mean scores for intrusive ($M=15.8$, $SD=8.4$) and avoidant ($M=13.3$, $SD=7.7$) cognitions were generally comparable to intrusion ($M = 11.1$, $SD = 9.0$) and avoidance ($M = 12.8$, $SD = 9.5$) scores obtained in the Cordova et al. study (2001) as well as scores obtained in the Epping-Jordan et al. study (Intrusions: $M = 14.1$, $SD = 8.3$; Avoidance: $M = 11.0$, $SD = 7.3$; Epping-Jordan et al., 1999). While the possibility exists that our sample from an internet support group might differ from the population of all women with breast cancer, the data suggest that these differences are not

pronounced. Additionally, our intent was to test propositions derived from a conceptual model of trauma adaptation and not to characterize breast cancer patients in general. Thus, while representativeness of internet study samples is an important issue, believe that our study findings would be generally robust in the absence of extreme differences between our internet sample and samples of breast cancer patients recruited through more typical means.

Other concerns relevant to an anonymous, internet-based study include the possibility of multiple submissions and submission of faulty or 'garbage' data. Although the independence of each record cannot be guaranteed, we feel confident that each record is distinct after reviewing demographic/clinical data for identical variables (e.g., age, education, geographic residence, date of diagnosis). No records were found to have more than four identical demographic/clinical variables. To screen for faulty data, demographic/clinical data were reviewed for indiscriminate responding such as date of birth after date of diagnosis or unacceptable date of birth. No records were found to have been entered indiscriminately. It has been suggested that problems of multiple submissions and faulty data are more likely in an internet study made available to search engines (Buchanan, 2000). Finally, while we used standardized questionnaires with recognized and acceptable reliability and validity, the reliability and validity of these questionnaires have not been evaluated in the context of internet administration. The extent to which internet completion yields reliable and valid data is a key question for future research.

In conclusion, we believe our results enhance understanding of psychological adaptation in breast cancer patients, in particular, and to traumatic and stressful events more generally. Based upon a social cognitive processing model of trauma adaptation, our results highlight the importance of both social and dispositional variables associated with cognitive and emotional processing of stressful or traumatic events. The inclusion of a theoretically-relevant dispositional characteristic, emotional intelligence, broadens this model and should serve to foster additional research.

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Table 1

Demographic Characteristics of Study Sample (n=210)

Characteristic	N	Percent
Marital Status		
Married/Cohabiting	158	75.2
Single/Divorced/Separated/Widowed	52	24.8
Ethnic Affiliation		
Caucasian	191	91.0
African-American	3	1.4
Asian	2	1.0
Latino/Hispanic	2	1.0
Native American	1	.5
Other	9	4.3
Missing	2	1.0
Education		
≤ 12 years	53	25.3
> 12 years and ≤ 16 years	88	41.9
> 16 years	69	32.8
Job Status		
Full time employment	116	52.2
Part time employment	42	20
Homemaker	18	8.6
Retired	11	5.2
Unemployed	6	2.9
Disabled	13	6.2
Missing	4	1.9
Annual Household Income		
<\$20K	9	4.3
\$20K-\$40K	55	26.2
\$41K-\$60K	46	21.9
\$61K-\$80K	27	12.9
>\$80K	68	32.4
Missing	5	2.4

Table 2

Descriptive Statistics for Study Measures (n=210)

Measure	M	SD	Cronbach's α
DUKE-SSQ	32.2	6.5	.88
SCS	31.3	10.8	.95
IES-Total	29.0	13.6	.85
IES-Intrusions	15.8	8.4	.88
IES-Avoidance	13.3	7.7	.75
HADS-Dep	4.0	3.5	.83
HADS-Anxiety	7.2	3.8	.84
TMMS-Total	118.5	14.4	.88

Note. DUKE-SSQ=Duke-UNC Functional Social Support

Questionnaire. SCS=Social Constraints Scale. IES=Impact of

Events Scale. HADS=Hospital Anxiety and Depression Scale.

TMMS=Trait Meta-Mood Scale.

Table 3

Intercorrelations Between Major Independent Variables (N = 210)

Measure	1	2	3	4	5	6	7	8	9	10
1. Age	1.0									
2. Education	.13	1.0								
3. Time since dx	.20**	.14*	1.0							
4. DUKE-SSQ	.01	.09	.04	1.0						
5. SCS	-.11	-.09	.04	-.48***	1.0					
6. TMMS	.04	.00	.00	.18**	-.11	1.0				
7. HADS-Dep	-.21**	-.12	-.18**	-.42***	.44***	-.34***	1.0			
8. HADS-Anxiety	-.12	-.06	-.10	-.28***	.40***	-.36***	.57***	1.0		
9. IES-Avoidance	-.15*	-.07	-.18**	-.18**	.42***	-.11	.50***	.62***	1.0	
10. IES-Intrusions	.02	-.10	-.16*	-.17*	.32***	-.38***	.34***	.39***	.43***	1.0

Note. DUKE-SSQ=Duke-UNC Functional Social Support Questionnaire. SCS=Social Constraints Scale. TMMS=Trait Meta-Mood

Scale. HADS=Hospital Anxiety and Depression Scale. IES=Impact of Events Scale.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4

Hierarchical Regression Analysis of HADS Depression and Anxiety scores (n = 210)

Variable/Step	HADS Depression			HADS Anxiety		
	ΔR^2	β^a	sr^2	ΔR^2	β^a	sr^2
Step 1	.06**			.02		
Age		-.14*	.017		-.05	.003
Marital status ^b		.02	.000		-.02	.000
Education		-.02	.000		.01	.000
Step 2	.03			.01		
Stage		.07	.004		-.03	.000
Type of adjuvant treatment ^c		-.04	.001		.04	.001
Type of surgery ^d		.15*	.020		.03	.001
Time since diagnosis		-.18**	.028		-.10	.009
Step 3	.31***			.25***		
DUKE-SSQ		-.23***	.034		-.06	.002
SCS		.31***	.069		.34***	.084
TMMS-Total		-.27***	.070		-.31***	.088
Full Model Statistics						
Multiple R	.635			.528		
Multiple R ²	.404			.279		
F-statistic ^e	13.44***			7.71***		

^aStandardized β coefficient for full, 10 variable model. ^bPartnered (1) vs. not partnered (0). ^cNone(0), radiation (1), chemotherapy (2), radiation and chemotherapy (3). ^dLumpectomy (1) vs.mastectomy (2). ^e $df = 10,199$.* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5

Hierarchical Regression Analysis of IES Intrusion and Avoidance scores (n = 210)

Variable/Step	IES Intrusion			IES Avoidance		
	ΔR^2	β^a	sr^2	ΔR^2	β^a	sr^2
Step 1	.03			.01		
Age		-.06	.003		.11*	.011
Marital status ^b		.00	.000		.03	.001
Education		.00	.000		-.07	.004
Step 2	.02			.03		
Stage		.00	.000		.02	.000
Type of adjuvant treatment ^c		.04	.001		-.01	.000
Type of surgery ^d		.05	.002		-.02	.001
Time since diagnosis		-.19**	.033		-.19**	.033
Step 3	.18***			.23***		
DUKE-SSQ		.04	.001		.07	.003
SCS		.43***	.140		.33***	.081
TMMS-Total		-.07	.005		-.36***	.125
Full Model Statistics						
Multiple R	.476			.523		
Multiple R ²	.226			.273		
F-statistic ^e	5.82***			7.49***		

^aStandardized β coefficient for full, 10 variable model. ^bPartnered (1) vs. not partnered (0). ^cNone(0), radiation (1), chemotherapy (2), radiation and chemotherapy (3). ^dLumpectomy (1) vs.mastectomy (2). ^e $df = 10, 199$.* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure Caption

Figure 1. Effects of social constraints and emotional intelligence on HADS-Anxiety scores.

Figure 2. Effects of social support and emotional intelligence on HADS-Depression scores.

Figure 1.

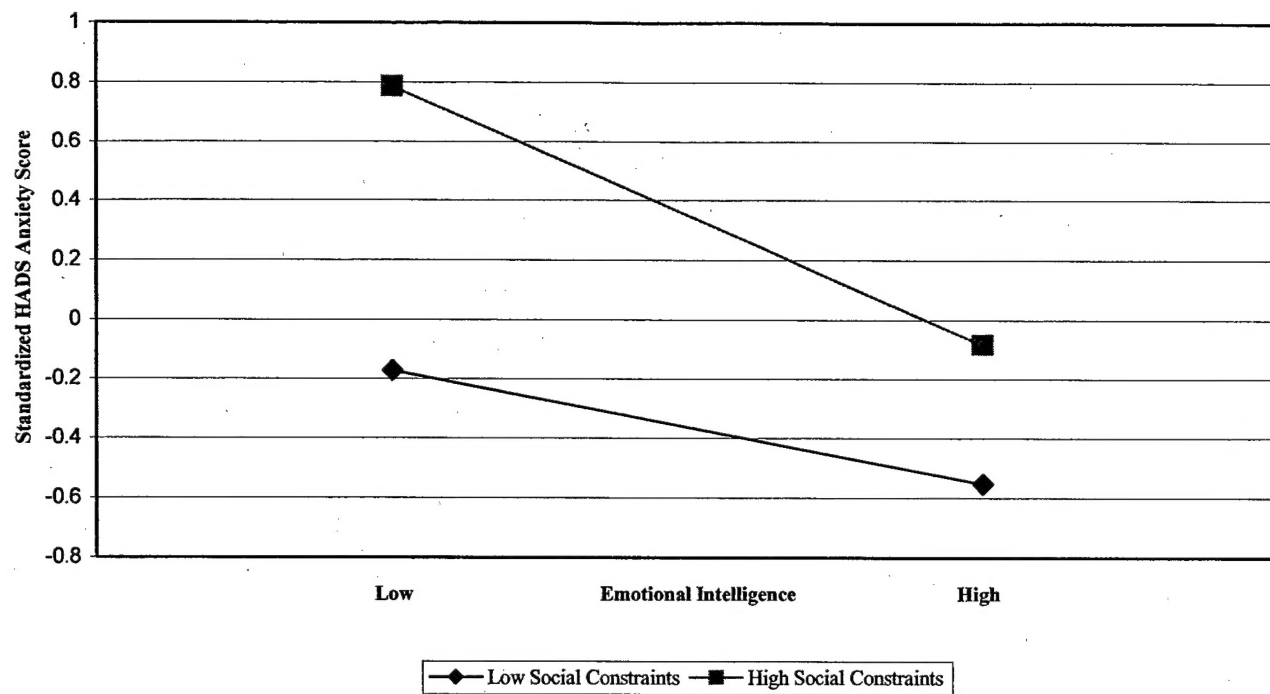


Figure 2.

